ARCHAEOLOGICAL EVALUATION (STAGE 3) AT RIPPLE, WORCESTERSHIRE (PNUM 3369 EVAL)

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Part 1 Project summary

In November and December 2003, Worcestershire Historic Environment and Archaeology Service undertook a field evaluation of a planned quarry on the floodplain of the Severn near Ripple, Worcestershire (NGR SO 8730 3700; WSM 33396). The evaluation was undertaken with the kind permission of the landowners, RMC Aggregates (Western) Ltd and their tenant Mike Evans, and funded though the Aggregates Levy Sustainability Fund managed by English Heritage. The evaluation was the third stage of archaeological work on the site, following a desk-based assessment, and co-ordinated geophysical, metal-detector and earthwork surveys allied to examination of LiDAR mapping. The previous stages had identified areas of potential archaeological significance, and the aim of the third stage was to test this potential by excavating trial trenches where these were practicable.

Four trenches were excavated in one field in the northern sector of the site, where cropmarks (but not geophysical anomalies) suggested ditched enclosures of Iron Age or Roman date. Another two trenches were excavated in adjacent fields in the southern sector, to establish whether a pit-alignment and parallel trackways visible as cropmarks on the adjacent gravel terrace continued onto the floodplain (though the geophysical survey showed no evidence of this).

The most conclusive and important results were obtained in the southern sector. First, a Late Neolithic or Early Bronze Age post-pit was found alongside four less certainly archaeological features. These features appear to extend the boundary represented by the pit-alignment across the floodplain. Although some uncertainty exists about its precise relationship to the pit alignment and the other features, the early date of the post-pit (established by radiocarbon dating of a tree-trunk placed within it) raises important questions about the use of the floodplain at this period. If this represents part of the pit alignment, it makes the monument the earliest of its type in the region and indicates land division at a particularly early date. On the other hand, if it represents an element of a different type of monument, it also has considerable research potential in respect of the Severn floodplain, where evidence of Neolithic to Early Bronze Age activity is very limited.

Secondly, the expected continuation of the trackways was confirmed by the discovery of two parallel ditches and associated banks. The ditches contained no dating evidence, but can probably be associated with a mid to later Iron Age hillfort 500m to the east. Both the post-pit and the ditches were associated with plant and pollen remains which suggest that the post-pit was excavated in birch/hazel woodland and heath, and that the ditches were excavated in a similar environment. The pollen and stratigraphic evidence combine to give an impression of early clearance of the floodplain, and a long period of slow aggradation, though the rate of alluviation appears to have increased from the Iron Age onwards, as the ditches were filled twice with alluvium and sealed by a succession of deposits.

Less conclusive results were obtained from the trenches in the northern sector (due in part to a depth restriction requested by the tenant farmer). As with the geophysical survey, no evidence of the ditches suggested by the cropmarks was found, though three other ditches in one trench appear to conform to the expected pattern. However, the ditches were so transformed by post-depositional changes as to be practically invisible, and some doubt must be expressed as to whether they have been correctly interpreted as archaeological features. Nevertheless, sherds of Roman pottery were recovered from the upper fills of two of the ditches, and they are stratigraphically later than alluvium also containing Roman pottery. Moreover, the field immediately to the east has produced a considerable amount of Roman coins and metalwork, which appear to indicate settlement, and provide a context for activity

to the west. It is therefore possible that the evidence represents peripheral activity, most probably associated with agriculture. More certain evidence of later activity was found in the form of two roughly-made stone surfaces, one of which can be associated with 18th century brickmaking. Little information on the development of the floodplain was recovered from the trenches in the northern sector, but there was less stratigraphic evidence for sustained overbank alluviation, and borehole records indicate that the underlying gravels are much higher than they are to the south.

In terms of the significance of these results, the Late Neolithic/Early Bronze Age pit alignment and the probable Iron Age ditches must be considered regionally significant on the grounds of their date, character, and contribution to current research frameworks. The alluvial deposits associated with these features are also regionally significant as a geoarchaeological and palaeoenvironmental resource with a high potential to contribute to an understanding of long-term floodplain development and utilisation. This importance is enhanced in the light of the importance of the River Severn as one of the major rivers in England, and in the light of the very limited research previously undertaken on its floodplain. On the other hand, no great significance can be claimed for the Roman deposits in the northern sector, nor for the later surfaces.

On the basis of the evaluation, and the high research potential identified for the site, English Heritage are requested to support additional evaluation and investigation through the extended Aggregates Levy Sustainability Fund. Such work would aim to further characterise and date the prehistoric features in the southern sector and to undertake further investigation of the palaeoenvironmental and geoarchaeological evidence.

Part 2 Detailed report

1. Background

1.1 Reasons for the project

The project was commissioned by English Heritage in response to a planned programme of mineral extraction to the south-west of Ripple by RMC Aggregates (Western) Limited (Fig 1). The site of the quarry (centred on NGR SO 8700 3670) has been identified as an area of potential archaeological significance (WSM 32187), though the quarry company's planning permission for extraction pre-dates the introduction of national and local government guidelines that require archaeological investigation in such circumstances (DoE 1990). To begin to address this situation, English Heritage (in consultation with the Service) considered that an archaeological evaluation was necessary and provided funding to support this work through the Aggregates Levy Sustainability Fund.

1.2 Project parameters

The project as a whole conforms to English Heritage guidelines (English Heritage 1991 and 2001), and to the Institute of Field Archaeologists' *Standard and guidance for archaeological evaluations* (IFA 1999). The present stage of the project conforms to an Updated Project Design prepared by the Service (Deeks and Jackson 2003).

1.3 Summary of Stages 1 and 2

1.3.1 Stage 1

Stage 1 of the project consisted of a desk-based assessment supplemented by a rapid walkover survey. A combination of existing SMR and documentary sources, aerial photographic interpretation and field observations identified evidence of occupation and other activity dating from the prehistoric, Roman, medieval and post-medieval within the project study area (Deeks and Jackson 2003). In particular, the following target areas for evaluation trenching were identified:

1. The northern part of the area (Fig 1, Fields F1 and F2): cropmarks indicated the presence of one or more enclosures with internal curvilinear features and two broad linear features that might represent tracks, field systems or former watercourses (Figs 2 and 3, features labelled B).

2. The central/southern part of the area (Fig 1, Fields F5 and F6): no cropmarks or documented sites were identified in this area, although cropmarks in the area immediately to the east suggest a concentration of enclosures and trackways (Fig 3, features D, E and F). The most significant of these cropmarks in relation to the permitted quarrying area are a pit-alignment and several trackways which run towards the area from Towbury Hillfort 500m to the east (Fig 3, feature E). These features were considered likely to continue beneath the alluvium on the floodplain.

3. The south-west of the area (Fig 1, Field F7): documentary sources record the discovery in this area of Roman pottery from a dark soil horizon 4 feet (1.22m) below the contemporary surface, though the exact location of the find-spot was not recorded.

The assessment therefore indicated a high potential for archaeological remains within the permitted area, and a project design was produced for further evaluation of this potential. The

Updated Project Design proposed two stages of fieldwork (Stages 2 and 3) to be followed by a final stage of reporting (Stage 4).

1.3.2 Stage 2

Stage 2 comprised non-intrusive geophysical, metal detector and earthwork surveys along with an assessment of high resolution topographical information supplied by LiDAR (Light Detection and Ranging) equipment (Fig 2). Local archaeologists from the South Worcestershire Archaeology Group (SWAG) participated in these surveys and received training in various techniques.

Geophysical survey

The geophysical survey was undertaken between 3rd and 5th of November 2003, with local archaeologists from SWAG receiving training for on the last of these three days. Five survey blocks in the areas identified above were surveyed in detail with a fluxgate gradiometer, following more widespread preliminary scanning.

The results of the geophysical survey provided little further information on the archaeological potential of the area. The most promising anomaly was a circular feature in Area 1/Field 7 (Fig 1) which lies in the general area of the 19th century find-spot. This feature is likely to be archaeological origin, though its form is not otherwise diagnostic. The other anomalies in this area and elsewhere were either weak, ill-defined pit responses or very faint linear trends, even in Area 5, where the survey blocks co-incided with mapped cropmark features. The low level of magnetic responses was considered to reflect the depth of alluvium on the floodplain and the lack of natural magnetism in the soils.

A copy of the geophysical survey report is appended to this report (Appendix 4)

Metal-detector survey

The metal detecting survey was undertaken in Field 2 by Dean Crawford from Metodet and trainees from SWAG on the 6 and 7 November 2003. This was targeted to try and establish the date of the cropmark complex plotted in this field and possibly define areas of higher potential within the field (Fig 3; feature B). Little of note was recorded with the exception of the head of a Roman brooch and a sherd of Roman Severn Valley Ware.

It was also reported that the field to the immediate east had produced abundant Roman metalwork finds as a result of metal detecting by four other detectorists to his knowledge, as well as by himself, in the last few years. Known finds include:

- forged *Dobunnic* Iron Age coin;
- 2 Iron Age/Roman brooches in very poor condition;
- Approximately half a dozen 1st century Roman coins in poor condition;
- 4 silver Roman coins of 2nd century date;
- *c* 50 Roman coins of 3rd - 4th century date;
- *c* 10(?) brooches of 3rd - 4th century date including fragments etc;
- two Saxon strapends of 7th – 9th century date;
- *c* 50 medieval coins.

These finds raised several possibilities with regard to the cropmarks in Field 2:

1. That the enclosures and other linear features plotted from cropmark evidence were of Roman date but relate to stock control or other activities adjacent to a focus of settlement and therefore contain little cultural material.

2. That the features giving rise to the cropmarks were too deeply buried to produce detectable finds within the current ploughzone.

3. That the features related to prehistoric activity, possibly seasonal (Iron Age?) on the floodplain and thus were likely to include have limited material culture incorporated in them.

An Iron Age terret ring was also found nearby, in a field to the south (shown on Fig 3 as including Feature C, WSM 1343), while a further Iron Age find (small bronze ring) and numerous Roman finds were found in the area of cropmark Features D and F (also shown on Fig 3), between Ripple lake and the road. Together these finds were felt to support the conclusions of the desk-based and aerial photographic assessments, namely that the cropmarks represent later prehistoric (and ?Roman) period settlement and associated activity areas.

Earthwork survey

Members of SWAG under the direction of the Project Leader undertook an earthwork survey in Field 1 on the 10th of November 2003. The survey was compromised by that fact that the field had been ploughed since the original walkover survey, and the already slight positive earthworks observed then had been completely removed. However, linear depressions broadly corresponding to the liner cropmarks flanking both sides of the field could just be discerned, and the eastern of these was surveyed and levelled in the short time available.

LiDAR data

The LiDAR data provided high-resolution topographical information for the permitted quarrying area and its environs (Fig 2). The data highlights the relief of the floodplain and adjacent terraces. This clearly shows that the cropmark complex plotted as Features D, E and F (Fig 3) occupies the long ridge of the first terrace running to the east of the permitted area, while the permitted area clearly occupies the floodplain. The data also suggests that the trackway and pit alignment of Feature E (Figs 2 and 3) extended into the permitted area beneath later alluvium. Other shallow depressions on the floodplain may relate to former boundaries, water management features or watercourses

1.4 Aims of Stage 3

In the light of the results of Stages 1 and 2, an *Interim statement and review of the Stage 3 design* was produced (Document submitted by Robin Jackson and dated 18 November 2003) to supplement the previous design (Deeks and Jackson 2003).

The Stage 3 proposals were approved and had the following general aims:

- to further assess the date, character, condition and vulnerability of deposits within the Evaluation Area;

- to ensure that a sample of the full range of potential deposits and conditions of survival was tested;

- to provide training in excavation techniques for members of South Worcestershire Archaeological Group.

Because of constraints imposed by current land-use, only Field 2 in the northern sector and parts of Fields 5 and 6 in the southern sector were available for trial trenching. For the northern sector, 2000m² of trenching was proposed, with the intention of targeting the enclosure ditches and internal features indicated by cropmarks, the anomalies to the north of the enclosure, and the broad linear anomalies to the east and west.

For the southern sector, 1500m² of trenching was proposed to investigate whether the pit alignment and linear cropmarks observed on the adjacent gravel terrace continued onto the floodplain. A total of 1200m² of trenching was allocated to test for features in this area, with a further 300m² being held in reserve to extend trenches if appropriate.

The project design also included provision for a field visit and subsequent analysis by a consultant geoarchaeologist. The aim of this study was to provide information on depositional and post-depositional processes, and to assess the potential for further work of this kind.

2. Methods

2.1 Fieldwork

2.1.1 Fieldwork strategy

The fieldwork strategy set out in the Updated Project Design, and in the subsequent Interim statement and review, could not be fully implemented due to a combination of ground conditions and the time constraints placed upon the fieldwork by the Aggregates Levy funding which required project completion by March 2004. This necessitated implementation of trenching during the difficult conditions encountered in a floodplain environment during winter months (November and December 2003).

This particularly affected work in the southern sector where rising water levels and the depth of alluvium encountered caused considerable problems. First, the depth of alluvium was greater than had been anticipated and increased machining time considerably, as the trenches had to be widened and battered by a 360º excavator in order to create a safe working environment. Secondly, the trenches reached well below the level of the water table, so that the trenches rapidly filled with groundwater. This made the trench sides unstable, and considerable time and effort was required to clear collapsed and slumped material. Thirdly, the rising groundwater meant that only one trench could be excavated at once, and then only with the constant use of several pumps. In the event, only two trenches with a total area of *c*550m² were excavated in the southern sector, and access to one trench for geoarchaeological investigations was not possible. Finally, these factors had a knock-on effect on the excavation of the shallower trenches in the northern sector, which had to be reduced to half their anticipated width in order to keep to time and budget.

Trial trenching followed the procedures of the Manual of Service Practice: fieldwork recording manual, 1995 as amended (County Archaeological Service internal report, 399). Of particular importance here were the Guidelines on evaluation, Finds recovery policy, and Guidelines for environmental sampling.

The following tasks were undertaken:

- All trenches were opened by a machine fitted with a toothless bucket. Machining was undertaken under the supervision of the Project Leader.
- Trenches were located using an EDM and tied to Ordnance Survey detail.
- All subsequent excavation was undertaken by hand.

- Exposed surfaces were cleaned and inspected, and preliminary trench records were made.
- Selected deposits were fully or partially excavated and recorded to determine their nature and to recover artefacts and environmental samples.
- Deposits were selected for excavation on the basis of the minimum required to meet the aims of the project.
- The Service's environmental archaeologist provided on-site advice.
- A soil scientist (Richard Payne of Terra Nova) made a single site visit to provide on-site advice on the character of deposits (alluvium and palaeochannels).
- The trenches were reinstated by backfilling the excavated material.

2.1.2 Analysis

Stratigraphic analysis was undertaken during and after the fieldwork; in both cases this involved defining deposits on the basis of a range of properties, inferring their mode of deposition and the extent of post-depositional change, and establishing their relative sequence. This information provided the framework for the environmental and artefactual analyses. The geoarchaeological observations and samples were analysed separately, as described below in Appendix 3.

2.2 Artefact analysis

2.2.1 Artefact recovery policy

All artefacts from the area of salvage recording were retrieved by hand and retained in accordance with the service manual (CAS 1995 as amended).

2.2.2 Processing and analysis

All hand retrieved finds were examined. A primary record was made of all finds on a Microsoft Access 2000 database. Artefacts were identified, quantified and dated and a *terminus post quem* produced for each stratified context.

Pottery was examined under x20 magnification and recorded by fabric type and form according to the fabric reference series maintained by the service (Hurst and Rees 1992).

2.3 Environmental remains

2.3.1 Sampling policy

The environmental sampling policy was as defined in the County Archaeological Service Recording System (1995 as amended). A number of samples were selected for analysis at key points in the stratigraphy and where material appeared to have an organic component. Monolith and bulk samples of 10 litres were taken from Trenches 5 and 6 for general environmental and plant macrofossil analysis (Table 1). In Trenches 5 and 6 bulk samples were taken for pollen analysis from contexts 557, 558, 609, 613, 617, and 627. Sediment analysis was undertaken on monolith samples from contexts 604-606, 622, 625-627, and various fills from cut 632.

2.3.2 Methods of analysis

For each of the macrofossil samples a sub-sample of 1 litre was processed by the wash-over technique as follows. The sub-sample was broken up in a bowl of water to separate the light organic remains from the mineral fraction and heavier reside. The water, with the light organic faction was decanted onto a 300mμ sieve and the residue washed through a 1mm sieve. The remainder of the bulk sample was retained.

Selected samples (contexts 625 and 634) were processed by flotation followed by wet-sieving using a Siraf tank. The flot was collected on a 300μm sieve and the residue retained on a 1mm mesh. This allows for the recovery of items such as small animal bones, molluscs and seeds.

The residues were fully sorted by eye and the abundance of each category of environmental remains estimated. The flots were scanned using a low power EMT stereo light microscope and plant remains identified using modern reference collections maintained by the Service, and seed identification manual (Beijerinck 1947). Nomenclature for the plant remains follows the Flora of the British Isles, 3rd edition (Clapham, Tutin and Moore 1989).

For pollen analysis, 3ml of sediment was measured volumetrically. Samples were washed in 10% Hydrochloric Acid and boiled in tetra-Sodium Pyrophosphate for 1 hour to remove clays. To remove the clays further, the samples were sieved through a 120 μm mesh and then onto a 10 μm mesh and the residue collected. Due to the alluvial nature of the sediments, the samples were processed using a swirling technique to remove the inorganic fraction, primarily silicaceous in character. This was used as an alternative to the Hydroflouric Acid digestion method. Finally the pollen pellet was stained with Safranine, washed in alcohol to dehydrate the sample, and preserved in Silicon Oil. Pollen grains were counted on a GS binocular polarising microscope at 400x magnification. Nomenclature for the pollen follows the Flora of the British Isles, 3rd edition (Clapham, Tutin and Moore 1989).

2.4 Dendrochronological and radiocarbon assays

2.4.1 Sampling policy

The project design allowed for the recovery of samples for dendrochronological and radiocarbon dating by external specialists. In the event, two samples from a single context (559) were sent to the dendrochronology laboratory of the Heritage and Archaeological Research Practice, University of Wales Lampeter and a single sample from the same context was sent to the University of Waikato Radiocarbon Dating Laboratory.

2.4.2 Methods of analysis

The sample sent for dendrochronolgical dating was assessed, but proved not to have enough rings to be correlated with known sequences, and no further analysis was undertaken. The sample sent for radiocarbon dating was given standard physical and chemical treatments, before being submitted to standard radiometric dating procedures. The results were then calibrated using Oxcal calibration software (Appendix 2).

2.5 The methods in retrospect

The problems caused by deep alluvium and a high water table in the southern sector were considerable, and required changes to the proposed fieldwork strategy. As a result, the trenched area was much less than anticipated, and conditions of access and visibility were not ideal. In addition, circumstances did not allow any geoarchaeological observations in one trench, where it would have been of significant value. However, the two trenches that could be excavated produced significant results that can reasonably be extrapolated over a wider area.

The knock-on effect of these problems in the northern sector only reduced the size of the trenched area, not the number or distribution of the trenches, and within the trenches enough evidence was visible to allow reasonable conclusions to be drawn about the area as a whole. The only problem with regard to the northern sector was a depth restriction of 0.50m that was set by the tenant farmer, who intends to plant the field in the spring, and requires a relatively undisturbed seed-bed. However, the necessary excavation of the few features provided small windows into deeper deposits, and two small sondages were also excavated in order to establish the alluvial context of certain remains.

In general therefore, the fieldwork can be said to have achieved the majority of its aims, despite the constraints that affected its conduct.

The same can also be said with regard to the post-fieldwork analyses. The artefact analysis was limited in view of the small size and low interpretative potential of the material, but nonetheless produced enough information to date several deposits and features, indicate other activities, and establish the condition of ceramics within the alluvium. Similarly, the analysis of a large number of environmental samples could not hope to be exhaustive, but was sufficient to demonstrate the survival and potential of both plant macrofossil and pollen remains. Likewise, the geoarchaeological analysis was sufficient to identify the potential of the deposits form provisional interpretations of depositional and post-depositional processes. Finally, although a dendochronological sample proved impossible to date, the radiocarbon sample successfully dated.

In conclusion, the methods are considered to have been appropriate to the aims of the project, the circumstances of the site and the nature of the evidence recovered, although further evaluation is recommended to fully determine the site's potential and allow appropriate mitigation strategies to be designed.

3. Results

3.1 Southern sector

Following the necessary re-adjustment to excavation strategy described above, two trenches were excavated in this sector (Fig 3). Both trenches were opened with the aim of picking up the projected line of linear cropmarks on the adjacent gravel terrace, with Trench 5 in Field 5 targeting a pit alignment, and Trench 6 in Field 6 targeting a number of parallel trackways (Figs 2 and 3). Geophysical survey in this area had not identified these features, due largely to the depth of alluvium in this area, and the lack of magnetism in these deposits.

3.1.1 Trench 5

Trench 5 was excavated in two lengths (Fig 4). The first length was excavated from north to south, until features were identified that appeared to relate to the expected pit-alignment. The trench was then excavated from east to west in search of further features on the expected line.

The first length of trench began with a deep sondage excavated to establish the depth and character of the alluvial sequence (Plate 1). The underlying gravels were not reached for safety reasons, but can be assumed from records of adjacent borehole to lie around 2.70m below the surface (Deeks and Jackson 2003, fig 2). The deepest deposits appeared to represent overbank alluviation and soil formation (contexts 510-514), with the remains of a former humic horizon being visible at the top of this sequence, around 1.30m below the surface (contexts 508 and 509). This horizon was overlain by another sequence of alluvial deposits, including a distinctive blue-grey gleyed unit (context 505) and an equally distinctive upper unit of reddish brown silty clay (contexts 502 and 503).

The first features exposed had the appearance of two intercutting pits (Fig 4, contexts 516 and 540; Plates 2 and 3). Both features were cut into the deposit beneath the former topsoil

(context 519). The features were treated as pits, and may have formed part of the pit-alignment visible on the terrace, although they were shallow in relation to their size, and their edges were indistinct. Also, their fills contained no artefacts or humic material (contexts 515 and 539=545). These characteristics might be taken to indicate a natural origin as tree-boles, tree-throws or animal burrows, but the features lack the other characteristics of these phenomena, such as irregular shapes and under-cut edges. Also, the fact that the features were shallow need not imply a natural origin, as in such an active depositional environment both natural and archaeological features inevitably lose their upper stratigraphy. For the present, therefore, the interpretation of these features must be left open.

The next feature to be exposed was much more archaeological in appearance. This was a small, sub-circular pit or posthole with concave sides and a rounded base (Fig 4, context 518; Plate 4). The fill of this feature was similar to that of the pits described above, but contained common fine to medium roots (context 517). The roots may indicate a natural origin, but may have penetrated from an upper horizon, and in other respects, the feature seems to be genuinely artificial. Because of its small size, the feature is unlikely to have formed part of the pit alignment, but it may indicate activity along its length.

Further to the west was another feature of dubious character: a relatively large oval cut or hollow with concave sides and a gently base (Fig 4, context 520; Plate 5). It was filled with gleyed alluvium with only a few fine to medium roots (context 519). Here again, the interpretation of this feature must remain open, but allowing for some loss of upper stratigraphy due to pedogenesis and slight over-machining, it could be seen as one of the pits forming the pit-alignment.

There is little doubt about the archaeological origin of the adjacent feature, however. This was a large sub-circular cut with near-vertical sides that continued at least 1.10m below the base of the trench (Fig 4, context 547; Plates 6 and 7), and was positioned directly on the projected line of the pit alignment. These characteristics would in themselves be reasonable proof of an archaeological origin, but the matter is settled by the presence of a large tree-trunk that had evidently been placed within the pit (context 559). Unfortunately, groundwater and ground conditions prevented excavation of the pit to its full depth and the recovery of the base of the tree-trunk. However, the upper part, which had broken away in antiquity, was recovered. This was unworked, so it was not possible to prove that tree-trunk had been felled before being placed in the pit, as the cut-marks that would demonstrate this would be borne on the lower part. There is also an outside possibility that the evidence represents a buried tree that had acted as a conduit for water perched in upper horizons, causing gleying around the trunk. However, the edges of the pit were the best-defined of any feature on the site, and the tree-trunk was neatly contained by them. Moreover, there was no evidence for buried trees elsewhere in the trench, with the exception of a much less substantial trunk or branch found on its side towards the east end. It can therefore be stated with confidence that the feature is genuinely artificial, and represents a post-pit with a tree-trunk serving as the post.

On this basis, the radiocarbon date of 2410–2130 cal BC (at 94.4% confidence) obtained from a sample of the trunk (the outer bark) can be seen as giving a reasonable indication of the date of the post-pit (Appendix 2). This date is of considerable importance as it not only fixes the date of this post-pit to the Late Neolithic or Early Bronze Age, but could apply also to the other, less certainly archaeological features in the trench.

Three of the other four features in the trench merit little comment, as they are almost certainly tree-boles or tree-throws (Fig 4, contexts 546, 548 and 554; Plates 8 and 10). The remaining feature, however, (context 538; Plate 9) may be a small pit or post-hole similar to the one described above (context 518), as it was much more regular in plan and profile. Some mention should also be made of a deposit of gleyed blue-grey alluvium partially exposed at the far west end, as this may correlate to a similar deposit in Trench 6 (context 559=612).

3.1.2 Trench 6

Trench 6 was excavated in two stages, with a wide area being opened first by a 360º excavator, and then a 2.40m wide slot being excavated by a mini-digger (Fig 5, showing only the deeper slot; Plate 12).

The earliest and most significant deposits in Trench 6 were two parallel ditches 10.75m apart (Fig 5, contexts 627 and 632; Plates 14 and 15). The ditches shared the same alignment as the trackways on the terrace (WSW to ENE) and can be assumed to represent the continuation of these features beneath the alluvium. The larger of the two ditches was found near the centre of the trench (Fig 3, context 628). In contrast to the features in Trench 5, and those in the northern sector, this ditch was well defined, allowing a reasonably confident interpretation of its history of use and disuse. The ditch was apparently cut through natural gravels (context 642), although it can be assumed that it was actually cut from a slightly higher level, through the soil that would have developed on the gravels and has since lost its organic properties. The upcast from the ditch was used to construct a steep and apparently well-consolidated bank on the south side (context 630). At some point after its construction, the ditch was filled and the bank abutted by a layer of alluvium (context 625=633). Then, at a later stage, the ditch was recut through the alluvium to something like its original profile (context 628), though no new bank was constructed. The rejuvenated ditch seems to have remained open long enough for a discrete deposit to accumulate in its base (context 627) but it was finally filled and the bank all but covered by another deposit of alluvium (contexts 622=644).

The smaller ditch towards the south end of the trench (context 632) had a very similar depositional history. Like its neighbour, it was probably cut through a soil that had formed on the gravels, with the upcast being used to construct a bank on its southern side. The ditch was later filled and sealed by the same alluvial deposit mentioned above, and then re-cut to a similar profile (context 635), although on this occasion the upcast was mounded on the north side (context 639). Finally, the recut ditch was filled and sealed by alluvium (contexts 637 and 644) which can be correlated with the later alluvium mentioned above (contexts 622).

Taken together, the stratigraphic evidence strongly suggests that the ditches were contemporary and functionally related. In view of their common alignment and spacing in relation to the cropmarks on the terrace, it is almost certain that all of these features represent the same phenomena, ie a corridor of tracks defined by flanking ditches and banks that extended across the terrace and onto the floodplain, if not all the way to the water's edge. Unfortunately, no artefacts or dateable organic remains were recovered from the ditches, and their date is uncertain. However, the cropmarks on the terrace appear to be aligned on the entrance to Towbury Hillfort which, though unexcavated, can be assumed to be of mid to late Iron Age date (GSMR 446). If, as seems likely, the tracks represented by the ditches and cropmarks were related to the hillfort, then there seems to have been a formal route between the hillfort and the Severn that was maintained over a period of years or even generations. It is also possible that the route was intended as a boundary, dividing the land to the north and south and mirroring the pit alignment less than 40m to the north.

The other deposits in Trench 6 were not certainly cultural, but are significant in representing the development of the floodplain. The alluvium sealing the ditches was noticeably shallower towards the north of the trench, and another layer of alluvium seems to have accumulated above it (Fig 5, context 604). This layer sealed two features that appear to represent the former location of trees growing on the floodplain at around the time the ditches were constructed (contexts 618 and 620). A declivity or depression remained however, and was only later filled by a sequence of discrete deposits (Fig 5, contexts 614-609 and 602; Plate 13), and a final layer of uniform reddish brown silty clay (context 601). The alluvial origins of these deposits are not in doubt, although the reasons for their embanked appearance are presently unclear. It is possible, however, that the lower alluvium was deposited not from the Severn itself, but from a former channel that flowed along the base of the gravel terrace, in the area now occupied by ponds and mapped in 1807 as wetland. The channel is also visible on the LiDAR plot running along the western edge of the first river terrace (Fig 2; and Deeks

and Jackson 2003, fig 6). High-energy deposition from this channel might account for the uneven bedforms visible in section, though the full complexity of the alluvial sequence has yet to be established.

3.2 Northern sector

Four trenches were excavated in Field 1 of the northern sector to target cropmarks and geophysical anomalies identified in Stages 1 and 2 (Fig 6).

3.2.1 Trench 1

Clear evidence of past activity was found beneath the modern subsoil in Trench 1 in the form of two cobble surfaces with frequent inclusions of brick and tile fragments. The most extensive surface (Fig 6, context 104; Plate 16) was found towards the south-west end of the trench, around 14m beyond a dry ditch that extends from the southern boundary to the western one (Fig 2). This surface was over 10.50m in length and at least 3.50m in width, and had a high proportion of small to medium brick fragments and rather fewer and smaller fragments of tile. A representative sample of this material was recovered and examined. The bricks were 2½ inches thick and of a uniform fabric, though most were over-fired and showed a gradation in colour from orange to purple. The width of the bricks suggests an 18th century date of manufacture, while the tiles are probably contemporary, being of a type manufactured between the 13th and 18th century. The surface also contained a single sherd of 17th to 18th century red sandy ware. The other surface (context 105) was found around 8m to the south, just inside the ditch (not as mapped by the Ordnance Survey in Fig 6). This surface was similar to the other in terms of its composition, but much less extensive; indeed, it appeared to have been laid in a north-south band around 1.85m wide.

The interpretation of this evidence is assisted by that of the Inclosure map of Ripple made in 1807, on which the ditch crossing the south-west corner of the field is shown as an undifferentiated field boundary (Deeks and Jackson 2003, fig 6). The small triangular field still defined by this boundary is also shown on the Inclosure map as being divided into two unequal parcels consisting of the apex and the lower part of the triangle. This seems to indicate an arrangement in which part of the field was taken out of cultivation or pasture and sub-divided for different purposes. According to the map, both surfaces would have lain within the smaller parcel, which comprised an area of just over half an acre. In view of this evidence, the high proportion of brick rubble and local abundance of alluvial clays, it seems most likely that the smaller parcel was set aside for brick manufacture, with the surfaces being laid for carts, drying sheds and kilns (though no cart-ruts or foundations were found within the trench itself). It also seems likely that the kilns were of the type known as clamps, built from the unfired bricks themselves which would have been stacked between layers of fuel (wood, charcoal, turf, coal or furnace debris), covered, and fired over several weeks (Brunskill, 1997, 27-28). Such kilns, though easily constructed were difficult to regulate, and often resulted in a high proportion of wasters (Raistrick 1972, 73). This interpretation would explain the concentration of over-fired brick fragments incorporated into the surface, and also visible on the surface of the field in the area immediately to the north of the trench (where it might be supposed that evidence of the kiln survives).

No other evidence of past activity was found in Trench 1, despite the fact that its east end crossed the line of a large linear cropmark feature and visible depression running parallel to the east side of the field (Fig 2). This feature had been supposed to be a large ditch or channel, but apart from a slight deepening and discoloration of the subsoil towards the east end of the trench, there was nothing to suggest the presence of an artificial or fluvial feature.

3.2.2 Trench 2

Trench 2 contained no significant archaeological remains, with the exception of two very doubtful postholes near the west end (contexts 204-206), and a single sherd of 1st to 4th

century Severn Valley ware from subsoil near the centre (context 207). An area around the postholes was extended in search of others, and another extension was opened around a possible gully further to the west, but no more postholes were found, and the gully proved to be illusory. As in Trench 1, no evidence was found of the cropmark feature and slight depression parallel to the east side of the field, nor of the similar feature identified on the west side (Figs 2 and 3).

3.2.3 Trench 3

Trench 3 contained the very ephemeral remains of three ditches: two on parallel east-west alignments near the northern end of the trench, and one on the same alignment towards the southern end (Fig 6). The northern ditches showed up as slightly darker bands against a lighter subsoil at 0.40m below the surface. Later hand-cleaning and sample excavation suggested that the ditches were real, rather than the result of wishful thinking inspired by the cropmarks, but they were both so indistinct as to be almost invisible, and the possibility that they have been wrongly identified as archaeological features must be acknowledged. The fills of the ditches were scarcely darker, coarser or more humic than the surrounding subsoil, and their profiles were defined as much by the distribution of manganese mottles as by any other characteristic (Plates 18 and 19). However, it can be suggested that the smaller ditch had concave sides and a flat base (context 305=307), while the larger one had concave sides and a rounded base (context 310). Both ditches also appeared to contain a much-altered primary/secondary fill overlain by a slightly darker tertiary fill. Only one artefact was recovered, a sherd of 1st to 4th century Severn Valley ware (fabric 12) from the tertiary fill of the smaller ditch (context 304). This sherd can only provide a *terminus post quem* for the final silting of the ditch, but taken together with the cropmark evidence, previous finds and the documented history of post-medieval land-use, a Roman date seems more likely than not. Moreover, the fact that the larger ditch was excavated on a parallel alignment suggests that both ditches were broadly contemporary, with one ditch perhaps replacing the other.

The ditch towards the south of the trench (context 316) was also identified as a slightly darker band at *c* 0.40m below the surface. This ditch was just as indistinct as those to the north, but it appeared on excavation to be relatively large (1.65m wide and 0.50m deep), with concave sides and a rounded base (Plate 17). It also appeared to have a sequence of three fills, the latest of which (context 313) produced a two small fragments of post-medieval brick or tile (fabric 12) However, this material represents the very last silting of the ditch and the feature and may long-post date its construction (if indeed the material is not intrusive); for these reasons, and in view of the wider context, a Roman date seems most likely

Taken together, the evidence suggests a number of boundary features on different alignments. As such, they appear to be related in some way to the enclosures suggested by the cropmarks, though there is no obvious correlation between the two types of evidence. With regard to the southern ditch, this may be correlated with the southern ditch of an apparent enclosure in the centre of the field, allowing for a 5m margin of error in transcription. However, the northern ditches cannot be correlated with any mapped cropmarks, and there was no evidence for the north-west to south-east aligned cropmarks that were mapped in their immediate vicinity. Similarly, there was no evidence for the right-angled corner of an internal enclosure suggested by cropmarks further to the south (Fig 7). Given the poor contrast between the fills of the excavated ditches and the surrounding subsoil, it is possible that these 'missing' cropmarks represent features that were simply not identified, but it must be allowed that the traces could relate to differences in soil moisture within the ploughsoil. This suggestion is supported by the results of the geophysical survey in the northern sector, which show little or no correspondence with the cropmarks (GSB 2003, figs 8 and 9).

In order to place the ditches within their depositional context, the opportunity was taken (in spite of the depth restriction) to excavate a small sondage at the northern end of the trench. (The disturbance caused by this sondage and another sondage in Trench 4 was minimal, and more than offset by reducing the planned width of the trenches.) The sondage showed that the modern subsoil (context 302) was around 0.10 deep, and appeared to overlie 0.20m of

similar, though slightly darker material (context 303); this in turn appeared to overlie more than 0.50m of lighter material, similarly composed but with common to frequent mottles indicating a fluctuating watertable (context 317). The sondage suggests that the ditches occur near the top of a long sequence of alluvial deposits, although evidence from Trench 4 described below suggests that the even the lowest of these deposits may contain cultural material.

3.2.4 Trench 4

The subsoil in Trench 4 was removed onto a gravel surface measuring at least 18m from east to west (Fig 6, context 404; Plate 20). Unlike the surface in Trench 1, this surface was composed of smaller stones, and no brick and tile inclusions were visible in plan, although a sherd of was recovered from a cleaning layer above the surface, and a sherd of mid 17th to 18th century pottery was found apparently within the surface itself.

The latter sherd suggests that the surface was broadly contemporary with that in Trench 1, and it may represent the same kind of activity undertaken there, but the lack of brick and tile inclusions would argue against this interpretation, and there is no indication from the 1807 Inclosure map that the area around Trench 4 was taken out of cultivation. Alternatively, the gravel surface could be associated with a footpath shown on the Inclosure map (and on the first edition Ordnance Survey map) which would have crossed the area of the trench on an east-west alignment (Deeks and Jackson 2003, figs 6 and 7). However, the boundaries of the surface suggest that its long axis was north-east to south-west rather than east-west, and it would be unusual for a footpath through an actively-managed field to be constructed in this way. A third alternative could be that the surface is in fact of Roman date, as it is has the same orientation as several cropmarks immediately to the west. However, this would mean regarding the 17th/18th century sherd as intrusive, which would be difficult to justify, and as noted above, the cropmark evidence cannot be taken at face value. Indeed Trench 4 provides another example of the limitations of this data, as there was no evidence for the small, curving enclosure that ought to have lain within it. In short, the interpretation of the gravel surface is problematic, and cannot be resolved at present.

Nevertheless, the surface was not the only archaeological deposit in Trench 4. A small sondage showed that the surface lay above an apparently sterile layer of alluvium (context 405-407), which became gradually darker in colour around 0.80m below the surface. A sherd of Severn Valley ware was recovered from the lower part of this deposit (context 408, broadly equivalent to context 317), giving it a 1st to 4th century *terminus post quem*. This deposit is significant for three reasons. In the first place, it demonstrates that archaeological remains are not limited to the top 0.50m of the northern sector. Secondly, if the deposit can be correlated with the lowest deposit exposed in the sondage in Trench 3 (and the depths and descriptions compare favourably), and if the ditches in Trench 3 are indeed Roman, then the Roman date of the deposit is confirmed on stratigraphic grounds. Thirdly, the alluvial origin of the deposit suggests activity coinciding with a phase of sustained overbank alluviation.

4. Specialist reports

4.1 Artefacts (Angus Crawford)

A summary of the artefacts recovered from the trenching is provided in Table 1. The assemblage derived from nine stratified contexts and ranged in date from the Roman to post-medieval periods and included six sherds of pottery.

The pottery was identified and grouped by fabric and context (see Table 2). The majority of the sherds were undiagnostic but could be dated between the mid 1st and 18th century by fabric type.

The majority of finds consisted of ceramic building material (82% of the assemblage) which also dated between the mid 1st to 18th century. Of these, twenty-eight pieces of brick and nine pieces of tile were recovered. Other finds included a Roman dolphin brooch and two iron nails from metal detecting.

Context	Material	Total	Weight (g)	*Terminus post quem*
103	Post-medieval brick	9	3460	Early eighteenth century
103	Post-medieval roof tile	2	108	Early eighteenth century
104	Post-medieval brick	13	1400	Early eighteenth century
104	Iron nails	2	43	Early eighteenth century
104	Post-medieval pottery	1	21	Early eighteenth century
104	Post-medieval roof tile	6	325	Early eighteenth century
105	Post-medieval brick	4	3100	Early eighteenth century
207	Roman pottery	1	1	Roman mid 1st to 4th
304	Roman tile	1	11	Roman mid 1st to 4th
313	Post-medieval brick	2	1	Post-medieval
313	Roman pottery	1	1	Post-medieval
403	Roman pottery	1	1	Post-medieval (by stratigraphy)
404	Post-medieval pottery	1	5	Post-medieval
408	Roman pottery	1	1	Roman mid 1st to 4th

Table 1: Quantification of the assemblage.

Context	Fabric name	Fabric	Total	Weight (g)
104	Red sandy ware	78.1	1	21
207	Severn valley ware	12	1	1
313	Severn valley ware	12	1	1
403	Severn valley ware	12	1	1
404	Post-medieval buff ware	91	1	5
408	Severn valley ware	12	1	1

Table 2: Quantification of assemblage fabrics by context.

4.1.1 Discussion

The discussion below is a summary of the finds and associated location or contexts by period. The importance of individual finds has been commented upon as necessary.

Roman

Four pieces of pottery and a single fragment of Roman tile were recovered, all from stratified contexts (207, 304, 313, 403 and 408). All pottery sherds were of small size and heavily abraded and identified as Severn Valley ware (fabric 12). It should be noted that the poor condition of the pottery may be a result of clay soils, which can detrimentally affect the preservation of this fabric type. Only three contexts were identified as Roman through a *terminus post quem,* these were contexts 207, 304 and 408.

A Roman brooch was also recovered during a metal detector survey in Field 2. Initial visual comparison indicates a dolphin brooch of 1st century date (Hattatt 2000, 298; fig 157 no. 358; item not included in assemblage Table 1).

Despite records of significant Roman activity in the surrounding area, there is little evidence from the finds assemblage to correlate this within the evaluation area.

Post-medieval

Two sherds of pottery were identified as post-medieval in date. A single rim piece of red sandy ware (fabric 78.1, context 104) and one piece of post-medieval buff ware (fabric 81.4, context 404) were dated to the 17th to 18th century. Other post-medieval finds included twenty-eight fragments of brick (contexts 103, 104, 105, and 313) and eight fragments of roof tile (contexts 103,104). The sample of brick fragments from contexts 103, 104 and 105 was interesting as each context contained bricks exhibiting deformities in morphology identifying them as possible kiln wasters. These three contexts (103, 104 and 105) were allocated *terminus post quem* of early eighteenth century on this material. Context 313 contained only small amounts of post-medieval ceramic building material (2g) so could only be broadly placed by *terminus post quem* as post -medieval in date.

4.2 Environmental remains (Elizabeth Pearson and Katie Head)

4.2.1 Trench 5

Environmental remains from the bulk samples were poorly preserved, with the majority of material comprising unidentified vegetative remains (Table 3). Only two contexts provided waterlogged remains. Context 537, a possible pit fill contained 1 nettle seed (*Urtica dioica*), indicative of waste or disturbed ground and suggestive of former human occupation, whilst the post-pit containing the large dated timber, provided only one unidentifiable seed (from context 557). In addition, contexts 517, 537, and 539 produced unidentifiable waterlogged wood fragments of varying sizes. Due to the alluvial nature of the site, all contexts in Trench 5 comprised a moderate to abundant amount of mineral material.

Pollen preservation was good, however, with both post-pit contexts (557 and 558) selected, providing a range of species. Both contexts were dominated by birch (*Betula*) and hazel (*Corylus*), as well as a small representation of heaths. This may suggest the clearing of the woodland and deterioration of the soils, as birch is an early coloniser of regenerating woodland. In addition, context 557 included a number of herbs such as grasses (Gramineae) and sedge (Cyperaceae), as well as wild strawberry (*Potentilla*) and meadowsweet (*Filipendula*), both suggestive of the clearance of woodland and the opening up of the landscape.

4.2.2 Trench 6

As with Trench 5, environmental remains were poorly preserved, with unidentified vegetative material making up the majority of samples (Table 3). In contexts 617 (tree throw fill) and 634 (primary ditch fill) fragments of charcoal were found indicating human occupation. Also in context 617, waterlogged unidentifiable wood and twig fragments were recorded, most probably residues of the tree throw context. The alluvial unit of context 613, not unsurprisingly, contained abundant mineral matter.

Again, as in Trench 5, pollen preservation was good, with the exception of context 617 where species composition was low. The other contexts (609, 613 and 627) selected, were similarly dominated by birch (*Betula*) or hazel (*Corylus*), or a mixture of both. Context 613 had the addition of heathland species including heather (*Calluna*), while contexts 627 and 609 contained a mixture of herbs, primarily Gramineae (grass) and sedge (Cyperaceae). Interestingly, context 609 included the presence of plantain (*Plantago lanceolata*), a common indicator of agriculture and human settlement. Many of these species, as in Trench 5, are open indicator plants or appear where soils have deteriorated, indicative of human interference.

Context	Sample	Context type	Description	Sample volume	Volume processed	Residue assessed	Flot assessed
309	7	fill	ditch 310	10	0		
311	6	fill	ditch 307	10	0		
315	13	fill	ditch	10	0		
517	1	pit fill		10	0		
519	4	fill	pit 520	10	1	N	Y
536	5	wood	above/within pit 536	10	0		
537	2	pit fill		10	1	N	Y
539	3	pit fill		10	1	N	Y
557	29	post pit fill	large pit timber	10	1	N	Y
558	30	post pit fill		10	0		
559	31	post	cut 547	0	0		
559	32	middle-base	timber sample	1	0		
604, 605, 606, 622	11	monolith		1	0		
606	24	layer	alluvial	10	0		
609	18	organic/alluvial unit	purple/maroon	1	0		
609	17	organic/alluvial unit	purple/maroon	10	0		
613	15	organic/alluvial unit	purple/maroon	10	1	N	Y
613	16	organic/alluvial unit	purple/maroon	1	0		
617	19	fill	tree throw	1	0		
617	14	fill	tree throw	10	10	N	Y
622	9	bank deposit	alluvial	10	0		
622	25	layer	alluvial	10	0		
622	8	layer	alluvial	10	0		
622, 625, 626, 627	10	monolith		1	0		
622, 626, 627, 625	12	monolith		1	0		
625	21	sandy fill	621	10	0	Y	N
627	20	fill	ditch 621	10	0		
630	22	bank material		10	0		
631	26	layer	alluvial	10	0		
634	28	bank sloping/ primary ditch fill		10	0	Y	N
637	27	fill	ditch 632	10	0		
various fills of cut 632	23	monolith	cut 632	1	0		

Table 3: List of environmental samples

4.2.3 Discussion

Environmental remains, with the exception of pollen, were poorly preserved at Ripple Quarry. This may be due to post-depositional change influenced by the fluctuating water table of the site, since the geoarchaeological assessment found that the sediments, like the environmental remains, had broken down and altered in structure (Section 4.3). This is in contrast to the nearby site of Ripple Brook, a tributary of the River Severn (SO 881387),

where Brown (1982) found pollen preservation was good. This was most probably due, however, to samples at Brown's site having only being taken from a 1 metre section of well humified wood and herbaceous peat. At Ripple Quarry conditions of preservation were less favourable, however, four contexts across the two trenches provided environmental evidence of human occupation. The pollen evidence from Ripple Quarry is promising however, with a number of herbs present, suggestive of human occupation and modification of the landscape.

The survival of pollen associated with datable deposits related to periods of human activity means that the site has the potential to refine and develop Brown's (1982) model for environmental change on the valley floor. Such opportunities to link data relating to long-term change (such as Brown's 1982 work) to detailed and dated sequences derived from phases of human activity during the prehistoric period are rare and to date only very limited work has been undertaken on such material from this major valley floor. As such these remains are considered to have a high regional research potential.

4.3 Geoarchaeology

The geoarchaeological study was commissioned from Terra Nova (geoarchaeological consultants). The report on these investigations is too lengthy and detailed to be included at this point in the report, and instead forms Appendix 3. However, it is worth noting here that some of the interpretations offered above and expanded on below differ at points with interpretations in the report. In particular, the argument for a long hiatus in overbank alluviation receives little support. However, it should be noted that evidence for a buried soil profile contemporary with the excavated features was recorded in Trench 5, where geoarchaeological observation was not possible, and that the upper boundaries of all features in the southern sector occupy a zone of no more than 0.41m.

5. Discussion

5.1 Late Neolithic/Early Bronze Age

The post-pit in Trench 5 is the only definite archaeological feature of late Neolithic/Early Bronze Age date found during the evaluation, but it is likely that some of the other features in Trench 5 are also archaeological and contemporary on the basis of their proximity to the post-pit, their apparent stratigraphy and common points of morphology. In particular, the two features resembling small pits or post-holes (contexts 518 and 538) and the three resembling larger pits (context 516, 520 and 540) have attributes that might be considered archaeological, and they can be distinguished from more obviously natural features in the centre and west of the trench. It is also noticeable that these features appear to form a line, or at least a linear band no more than 1.50m wide. However, the possibility that this reflects the similar orientation of the trench should be acknowledged, while another feature which is almost certainly a tree-throw (context 546) also lies within this band. This last point may be significant, as the use of tree-boles as repositories for Neolithic cultural material is not unknown, and there may have been little distinction in effect between a tree-trunk set into a pit and a growing tree. In summary, therefore, the post-pit can be regarded as certain evidence of late Neolithic/Early Bronze Age activity, and four or five other features may have been contemporary and related.

With regard to the context of this activity, it is likely that at least some of the features formed part of the pit-alignment visible on the gravel terrace. The pit alignment can therefore be projected across the floodplain for at least 330m from the easternmost cropmark to the post-pit, and possibly as much as 750m from the easternmost cropmark to the river, though the eastern continuation of the line is uncertain. At all events, the features lie almost directly on the projected continuation of the pit-alignment, and their presence at such a point is very unlikely to be accidental. If the post-pit formed part of the pit alignment, then the monument can be seen as the earliest dated example in the region, and a rare find of this period. On the

other hand, it is possible that the other features represent the continuation of the pit-alignment, in which case the post-pit may represent a different monument, though almost certainly related to the pit-alignment in some way.

To provide a wider context in which to place the evidence, pit-alignments as a type of monument have been described and classified at a national level by English Heritage (1989). Most of the classifications are based on topographical and morphological criteria determined from cropmarks, as very few sites have been excavated. On the basis of limited evidence, however, the description dates pit-alignments to a broad period between the later Neolithic and the Roman period (English Heritage, 2-3). At a regional level, more than 30 pit-alignments of various types are known from cropmarks in the Severn and Avon valleys (Baker 1992, fig 9.102), though very few have been mapped, and only one or two have been excavated (all in Warwickshire), and the results have not yet been fully published. Set against this background, the Ripple pit-alignment can be seen as example of a common and recognised type consisting of "round/oval pits in an alignment at right angles to a river" (English Heritage, 1989, 5). However, if the post-pit formed part of the pit alignment, the monument would be atypical in the present state of knowledge, as the pits in the few excavated examples all seem to have been left open (English Heritage 1989, 4; Palmer 1979, 38; Wilson 2000, 147-8). Nevertheless, it appears (from a limited literature search) that few pit-alignments have been excavated on floodplains, where conditions favour the survival of wood.

In summary, three propositions can be made. First, the continuation of the pit-alignment seems reasonably certain, but whether it is represented by the post-pit or the other features remains in doubt. Secondly, the date of the pit-alignment is uncertain, but a Neolithic/Early Bronze Age date remains a possibility. Thirdly, even if the post-pit did not form part of the pit alignment, it almost certainly represents a monument of some kind, which had some relationship to the pit-alignment.

Something more concrete can be said about the environment in which the post-pit (and possibly the pit-alignment) was constructed. The pollen evidence suggests an environment of birch/hazel woodland and grassland which is quite unlike the "wet woodland" of alder carr that might be expected on an aggrading floodplain and which is suggested by the nearby Ripple pollen sequence (Brown 1992). The presence of tree-boles and tree-throws at the same stratigraphic position as the post-pit, and the remnant soil horizon that may be broadly contemporary with all of the features supports the suggestion that the pit-alignment was constructed in relatively dry conditions, possibly following tree-clearance. All of this implies a long period of limited overbank alluviation that is unexpected and potentially significant, though more evidence would be required to establish the frequency of depositional episodes.

5.2 Iron Age

No firm evidence of Iron Age activity was identified in the evaluation, but as noted above, the two parallel ditches in Trench 6 appear to represent the continuation of trackways extending from Towbury hillfort, 500m to the east. The pollen evidence from the primary fill of the larger ditch suggests that the local environment was similar to that of the late Neolithic/Early Bronze Age, which suggests a long period of stablilty, although such a small sample may not be representative. At all events, the stratigraphic evidence clearly shows that both ditches were soon inundated in a major phase of overbank alluviation. This phase seems to have been sustained, as the ditches were re-cut, only to be filled again, and sealed by a succession of deposits. At present, it is uncertain to what extent this phase is represented in the northern sector, as borehole records show that the underlying gravels are much higher here (Deeks and Jackson 2003, fig 2), and the area may not have received the same amount of sediment. However, the phase may be associated with the lowest deposits exposed in Trenches 3 and 4.

5.3 Roman

On stratigraphic grounds, the earliest evidence for Roman activity was represented by the lowest deposit exposed in Trench 4 in the northern sector of the site. This deposit was plainly alluvial and contained a single sherd of abraded Severn Valley ware, suggesting activity of some sort on an aggrading floodplain. If, as seems likely, this deposit can be correlated with the lowest deposit in Trench 3, then it seems that a phase of alluviation was followed by a period of stasis, in which further Roman activity took place. In the present state of the evidence, the nature of this activity is unclear. The three features in Trench 3 described above as ephemeral ditches are not certainly real, nor certainly Roman, but on balance, they are probably both, and represent the construction of several small enclosures. The same pattern is also suggested by the cropmarks (though these may reflect differences in the ploughsoil), and seems inherently likely in view of the concentration of Roman finds in the field immediately to the east, which suggest settlement or at least sustained activity throughout the Roman period in the immediate vicinity. However, in view of the scarcity of material associated with the ditches and contained in the ploughsoil (with the exception of a 1st century brooch), it seems most likely that the enclosures contained livestock or cultivated ground rather than domestic buildings.

Unfortunately at no stage of the project has it proved possible to locate the Roman deposits reported by the 19th century antiquarian Allies, which records indicate should lie somewhere in the vicinity of the southern part of the site. However, it is perhaps of note that the depths at which he recorded these deposits (4 foot) appear to correlate with the depths at which the trackway of probable Iron Age date and the earlier post/pit alignment were encountered. This suggests that the reports may be accurate and that these potentially significant deposits may remain to be located somewhere in the permitted quarrying area.

5.4 Post-medieval

In the absence of any evidence for medieval activity, it might be assumed that the floodplain was used as pasture or possibly arable land in this period, although the depth of alluvium in the southern sector suggests that this area at least was subject to continued overbank alluviation, and would have been unsuited to either form of land-use. However, by the 18th century, it appears that the floodplain was stable enough to allow the present pattern of fields to be laid out and maintained, and to allow brick manufacture associated with a cobble surface in the south-west corner of Field 2. There also seems to have been contemporary activity in the far north of the field, represented by the gravel surface in Trench 4, though the nature of this activity is uncertain, and there is an outside chance that the surface might be Roman.

6. Significance

The significance of the deposits and features identified during the evaluation is a product of their date, character, condition and vulnerability, and their contribution to current research frameworks.

6.1 Deposits of potential regional and national significance

The late Neolithic/Early Bronze Age post-pit and associated palaeoenvironmental material must be considered as regionally significant on the basis of the rarity of surviving remains of this date and type. The potential association with a pit-alignment raises important questions about the dating of these monuments and the start of land division on the floodplain and terraces of the Severn. The general scarcity of Neolithic activity on the Severn floodplain has been observed (Darvill 2000; Jackson 2003). However, the Late Neolithic and Early/Middle Bronze Age have been seen as periods when the Severn Valley appears to have been more widely exploited (Darvill 2000), although Garwood has recently noted the relative scarcity of funerary monuments of this period in the Severn Valley (Garwood 2003). Despite this,

evidence is largely restricted to the terraces rather than the floodplain and certainly Brown (1982) has suggested that the floodplain may not have witnessed significant clearance until considerably later. In this light, the identification of potential monumental activity and possible (?limited) clearance of the surrounding area as evidenced in the pollen record is of considerable importance to research frameworks relating to this region and more specifically to this major, but poorly understood river valley.

The probable Iron Age ditches in Trench 6 must also rate as regionally significant, as they almost certainly constitute evidence of a link between the nearby hillfort and the river (or perhaps to a ferry or landing point). The ditches also formed a boundary crossing the landscape at this point and apparently mirror the line of the earlier pit alignment. Although hillforts have been relatively well researched in the region, their associated landscapes remain poorly understood and therefore the identification of a clearly linked, major landscape feature and associated well preserved pollen remains has considerable research potential.

The combination of datable horizons of human activity sandwiched in a considerable depth of alluvium and associated with well preserved pollen and some plant macrofossils, provides a rare and valuable opportunity to study long-tern patterns of landscape change and utilisation. As a result, the site is considered to have considerable regional significance. This significance is enhanced to potential national level by its geographical association with the Severn Valley which represents one of the major rivers in Britain, yet has been poorly researched beyond its estuary in contrast to rivers like the Thames and Trent.

In summary, the features in Trenches 5 and 6 are rare finds in terms of their date and type, are relatively well-preserved, and are contained within an alluvial sequence that informs their interpretation. Such deposits are likely to extend across most of the southern half of the permitted quarrying area and this area may also include the area of Roman deposits recorded in the 19th century (Deeks and Jackson 2003, 8). These deposits were not identified in the evaluation, though it is worth noting that the buried soil horizon in Trench 5 occurred at the same depth as recorded in the 19th century account. Potentially important palaeoenvironmental and geoarchaeological sequences may also extend into the northern part of the site.

6.2 Deposits of potential local interest

No great significance or potential can be claimed for the Roman deposits in Field 2, in the northern part of the permitted quarry. The probable ditches are so transformed by post-depositional processes as to be practically invisible, and in addition they contain very little cultural material and are more likely to relate to stock enclosures and agriculture rather than settlement. Similarly, the post-medieval evidence for brick manufacture is not very significant, for all that the rural aspect of this industry has received very little attention. Nevertheless, as pointed out above the lower alluvial deposits in Field 2 are likely to be of some geoarchaeological and palaeoenvironmental interest, and the differences between the results obtained by different techniques present a methodological problem that is worth investigating to inform other projects in similar contexts.

7. Recommendations

It is recommended that a further stage of evaluation and investigation be undertaken to focus on characterising the features in the southern sector. The following recommendations are made.

Trenching to further investigate the character and dating of the prehistoric deposits in the southern part of the permitted area. Particular attention should focus upon:

- the area around the post-pit of Late Neolithic to Early Bronze Age date;

- establishing the relationship between the post-pit and he pit alignment;
- establishing whether the pit-alignment extends further across the floodplain;
- establishing whether the trackway continues further across the floodplain;
- more accurate dating of these phases of human activity.

Trenching and possibly augering is recommended to further sample and characterise the paleoenvironmental remains. In particular:

- due to the good pollen preservation in alluvial sediments and datable features, further sampling is recommended to allow sufficient material to be collected to produce pollen diagrams relating to a range of site phases;
- sampling of the most organic deposits for other environmental remains and where further evidence of human occupation is found is recommended;
- although only one radiocarbon age was submitted, there is the potential for further prehistoric features to be dated;

Further geoarchaeological survey and study would also be valuable because there is evidence in both the broad and detailed structure of the deposits, which represents the general history of alluvium sources, deposition and post-depositional change on this important valley floor. In particular, the following tasks are recommended

- A combined geophysical and coring survey be used to create a 3-Dimensional stratigraphic model over a wider area, in order to guide future, more specific investigations;
- A combination of textural, micromorphological and mineral analyses to investigate the fine structure of the deposits and their mineral constituents.

It is requested by the Service that this further evaluation and investigation be considered for funding though the extended Aggregates Levy Sustainability Fund to ensure that a proper mitigation strategy can be devised for this important site.

8. Publication summary

The Service has a professional obligation to publish the results of archaeological projects within a reasonable period of time, and intends to use the following summary as the basis for publication in local or regional journals. The client is requested to consider whether or not the content of this section is acceptable.

In November and December 2003, the Service undertook a field evaluation of a planned quarry on the floodplain of the Severn near Ripple, Worcestershire (NGR SO 8730 3700; WSM 33396). The evaluation was undertaken with the kind permission of the landowners, RMC Aggregates (Western) Ltd and their tenant Mike Evans, and funded though the Aggregates Levy Sustainability Fund managed by English Heritage.

The evaluation was the third stage of archaeological work on the site, following a desk-based assessment, and co-ordinated geophysical, metal-detector and earthwork surveys allied to examination of LiDAR mapping. These had identified areas of potential archaeological significance, and the aim of the third stage was to test this potential by excavating trial trenches where these were practicable. Four trenches were excavated in the northern part of the site, where cropmarks (but not geophysical anomalies) suggested ditched enclosures of Iron Age or Roman date. Another two trenches were excavated in fields to the south, to

establish whether a pit-alignment and trackway, identified through cropmark evidence on the adjacent gravel terrace, continued onto the floodplain (though the geophysical survey showed no evidence of this).

Although ground conditions on the river floodplain during the period of work caused considerable problems, important results were obtained in the southern part of the site. A Late Neolithic or Early Bronze Age post-pit was found alongside four less certainly archaeological features. These features appear to extend the boundary represented by the pit-alignment across the floodplain. Although some uncertainty exists about its precise relationship to the pit alignment and the other features, the early date of the post-pit (established by radiocarbon dating of a tree-trunk placed within it) raises important questions about the use of the floodplain at this period. If this represents part of the pit alignment, it makes the monument the earliest of its type in the region and indicates land division at a particularly early date. On the other hand, if it represents an element of a different type of monument, it also has considerable research potential in respect of the Severn floodplain, where evidence of Neolithic to Early Bronze Age activity is very limited.

Secondly, the expected continuation of the trackway was confirmed by the discovery of two parallel ditches and associated banks. The ditches contained no dating evidence, but can probably be associated with a mid to later Iron Age hillfort 500m to the east.

Both the post-pit and the ditches were associated with pollen remains, which suggest that the post-pit was excavated in birch/hazel woodland and heath, and that the ditches were excavated in a similar environment. The pollen and stratigraphic evidence combine to give an impression of early clearance of the floodplain, and a long period of slow aggradation, though the rate of alluviation appears to have increased from the Iron Age onwards, as the ditches were filled twice with alluvium and sealed by a succession of deposits.

Less conclusive results were obtained from the trenches to the north (due in part to a depth restriction). As with the geophysical survey, no evidence of the ditches suggested by the cropmarks was found. Three ditches were identified and appear to represent one or more enclosures, however, these were so transformed by post-depositional changes as to be practically invisible, and some doubt must be expressed as to whether they have been correctly interpreted as archaeological features. Nevertheless, Roman pottery was recovered from the upper fills of two of them, while the alluvium through which they appeared cut also contained Roman pottery. Since a field immediately to the east has produced a considerable amount of Roman coins and metalwork, it can be suggested that the evidence reflects stock enclosures or other agricultural activity peripheral to an area of settlement. More certain evidence of later activity was found in the form of two roughly-made stone surfaces, one of which can be associated with 18th century brickmaking. Little information on the development of the floodplain was recovered from the trenches in the northern sector, but there was less stratigraphic evidence for sustained overbank alluviation, and borehole records indicate that the underlying gravels are much higher than they are to the south.

In terms of the significance of these results, the Late Neolithic/Early Bronze Age pit alignment and the probable Iron Age ditches must be considered regionally significant on the grounds of their date, character, and potential contribution to current research frameworks. Associated alluvial deposits are also regionally significant as a geoarchaeological and palaeoenvironmental resource with a high potential to contribute to an understanding of long-term floodplain development and utilisation. This significance is enhanced in the light of the importance of the River Severn, and in the light of the very limited research previously undertaken on its floodplain. On the other hand, no great significance can be claimed for the Roman deposits in the northern sector, nor for the later surfaces.

On the basis of the evaluation, and the high research potential identified, English Heritage are requested to support additional evaluation and investigation through the extended Aggregates Levy Sustainability Fund. Such work would aim to further characterise and date

the prehistoric features in the southern sector and to undertake further investigation of the palaeoenvironmental and geoarchaeological evidence.

9. The archive

The archive consists of:

22	Fieldwork progress records AS2
11	Photographic records AS3
2	Sample records AS17
101	Abbreviated context records AS40
6	Trench record sheets AS41
2	Alluvium record sheets AS42
37	Scale drawings
1	Box of finds
1	Computer disk

The project archive is intended to be placed at:

Worcestershire County Museum
Hartlebury Castle
Hartlebury
Near Kidderminster
Worcestershire DY11 7XZ
Tel Hartlebury (01299) 250416

10. Acknowledgements

The Service would like to thank Mike Roberts, Alison Pritchard and Tony Rowley (RMC Aggregates (Western) Ltd), Mike Evans (tenant farmer), Malcolm Atkin and Mike Glyde (Worcestershire County Council) and Kathy Perrin and Kath Buxton (English Heritage) for their kind assistance. Ken Pink (Ken Pink Plant Hire), and his drivers Dan and Chris are also thanked for their heroic efforts in difficult circumstances.

11. Personnel

The fieldwork and report preparation was led by Darren Miller. The project manager responsible for the quality of the project was Robin Jackson. Fieldwork was undertaken by Rosemary Jones, Darren Miller, Adam Mindykowski, Alvaro Mora-Ottomano, Marc Steinmetzer and Simon Sworn from the Service with the assistance of Vanda Bartoszuk, Mary Biddulph, Niccy Gooch, Roger Jackson, Mike McCurdy, Bob Ruffle, Steve Southwick, Dennis Williams from the South Worcestershire Archaeology Group. Rosemary Jones and Simon Sworn assisted with stratigraphic analysis. Environmental analysis was undertaken by Elizabeth Pearson and Katie Head; finds analysis by Angus Crawford; and illustration by Carolyn Hunt and Laura Templeton. Richard Payne contributed the geoarchaeological report, and Nigel Nayling examined and commented on the timber sample.

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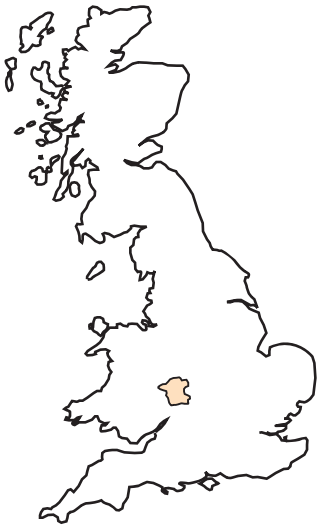
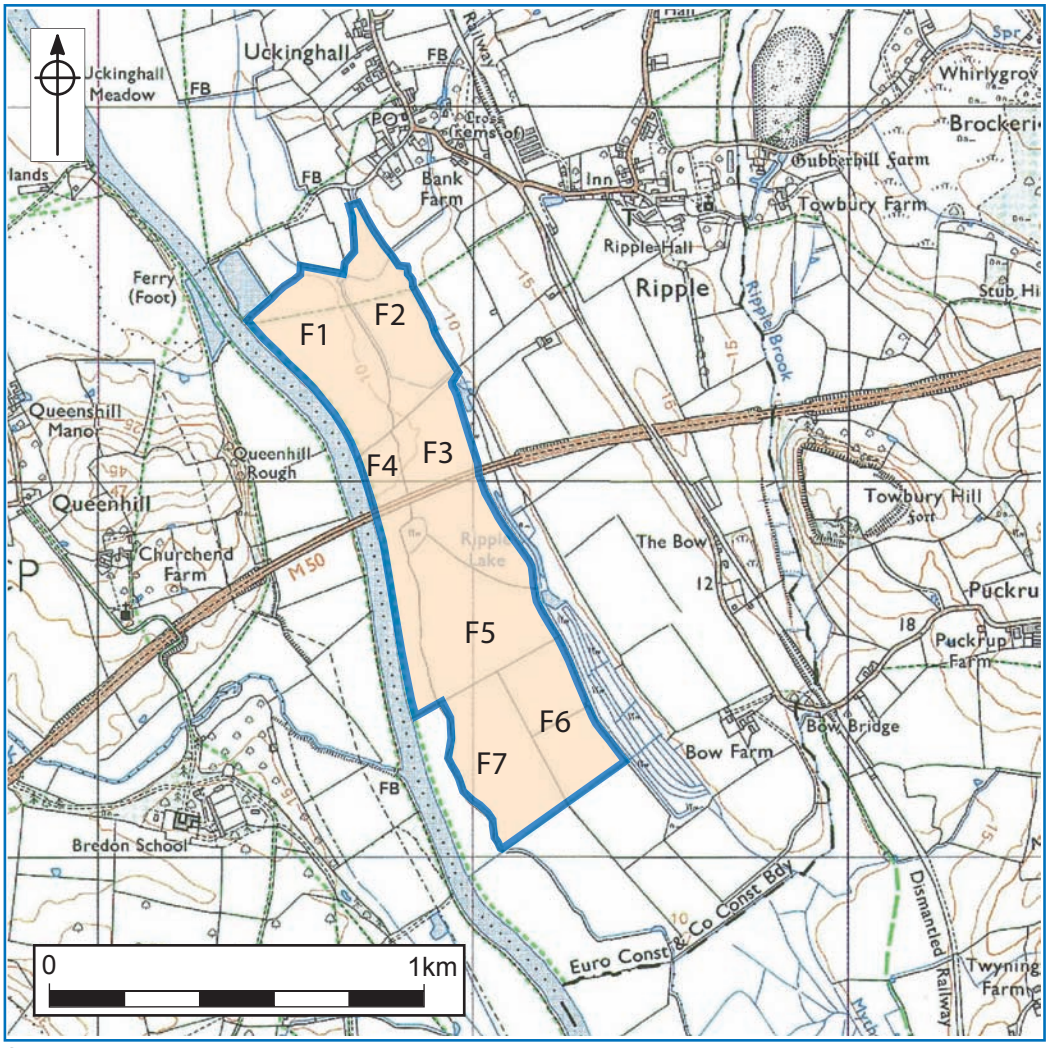




Location of the site.

Figure 1

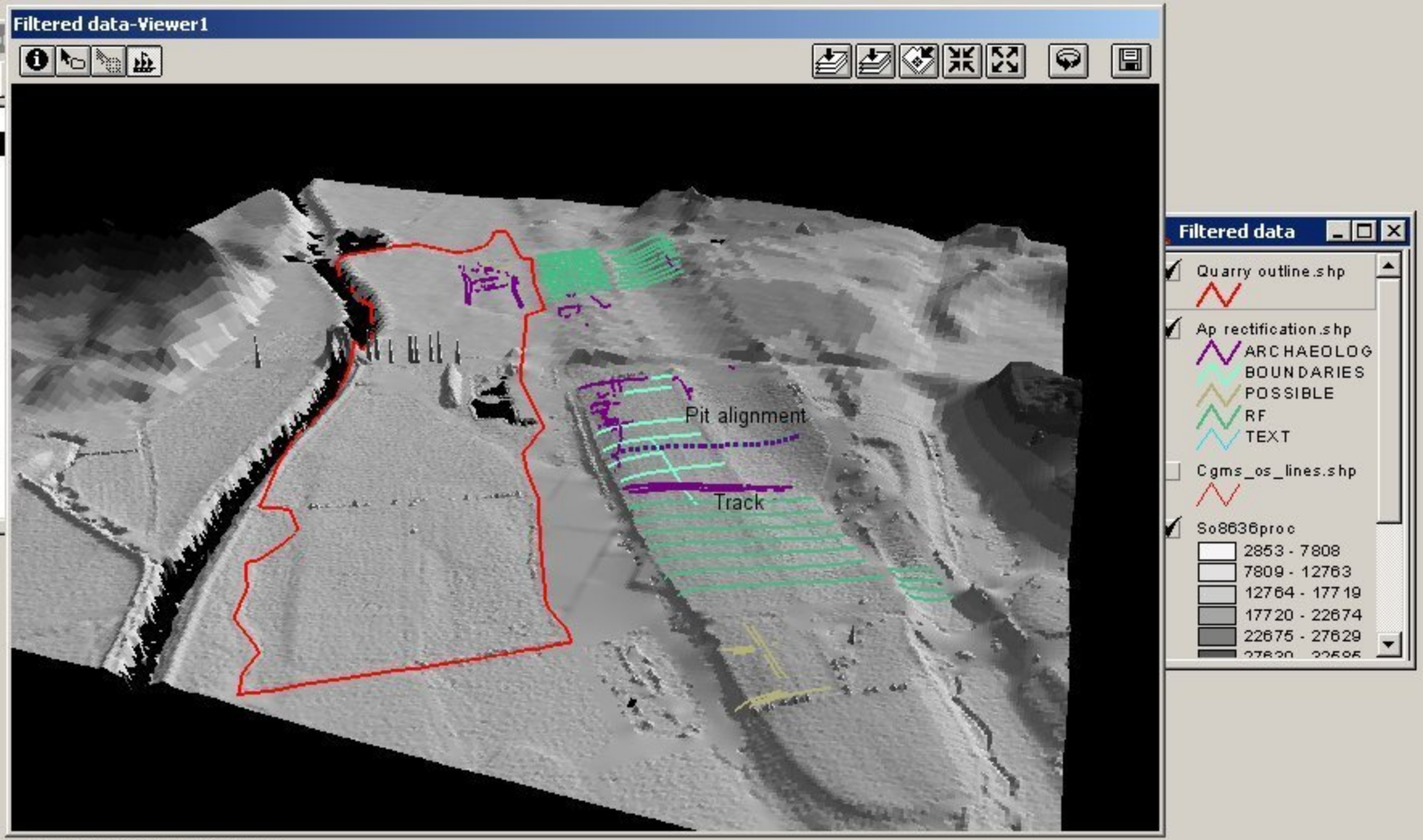
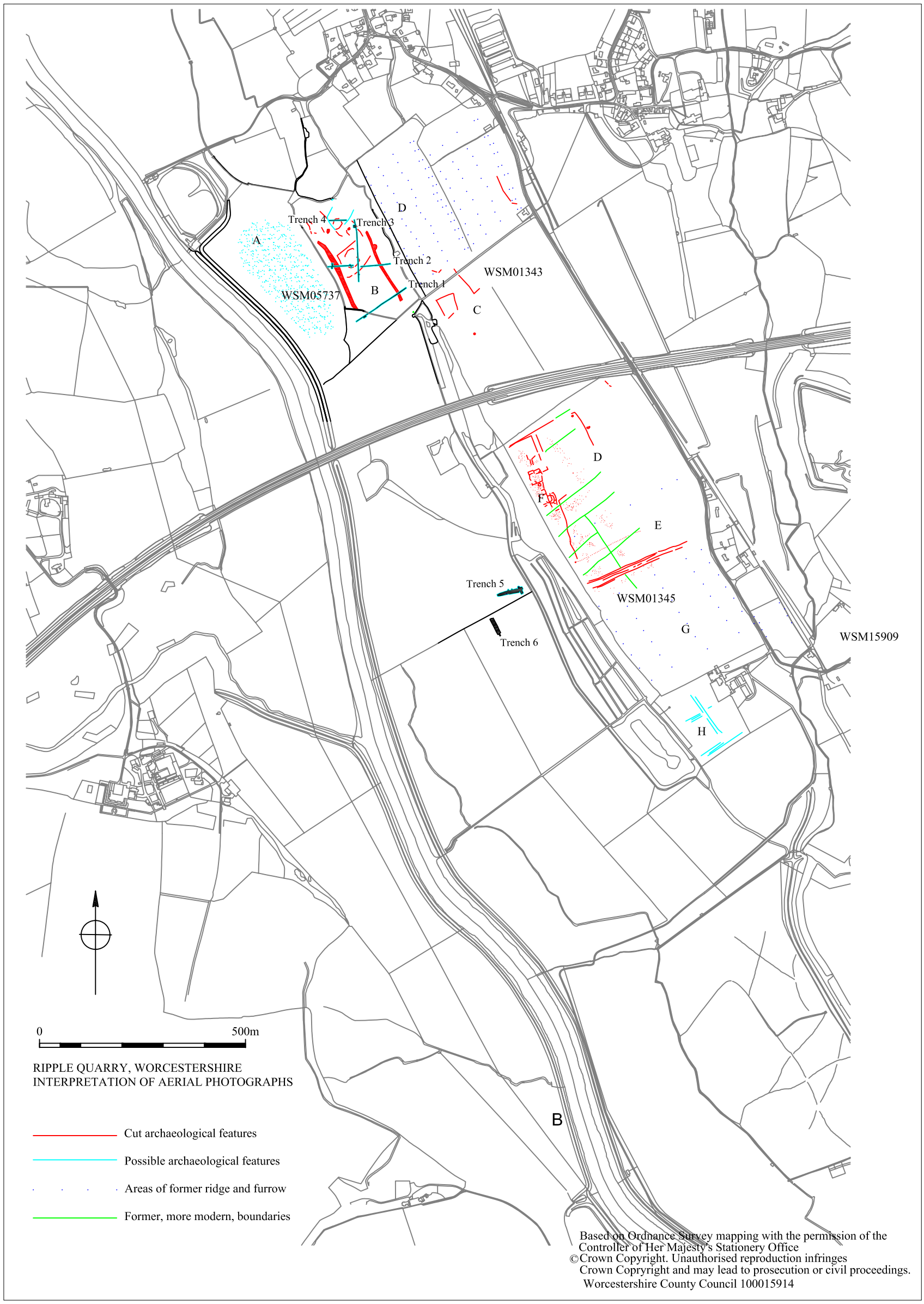
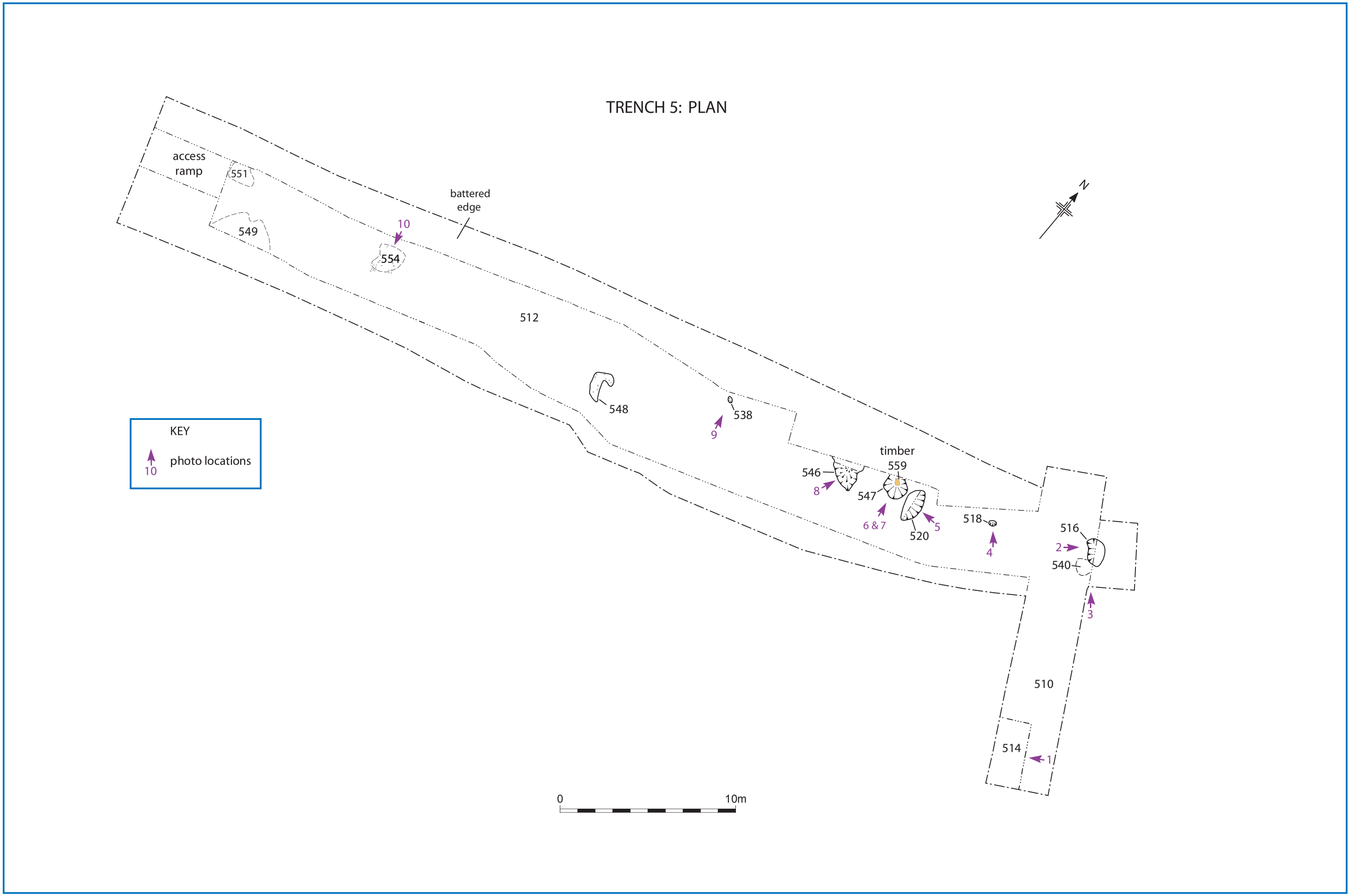


Fig 2 Cropmarks and topography



Cropmarks and trench locations

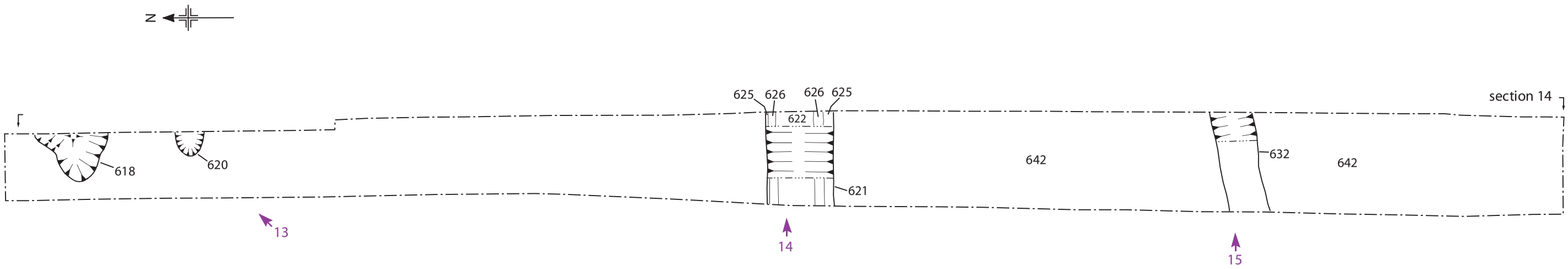
Figure 3

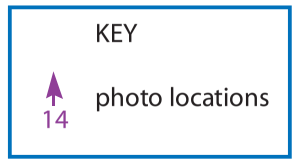


Trench 5 plan.

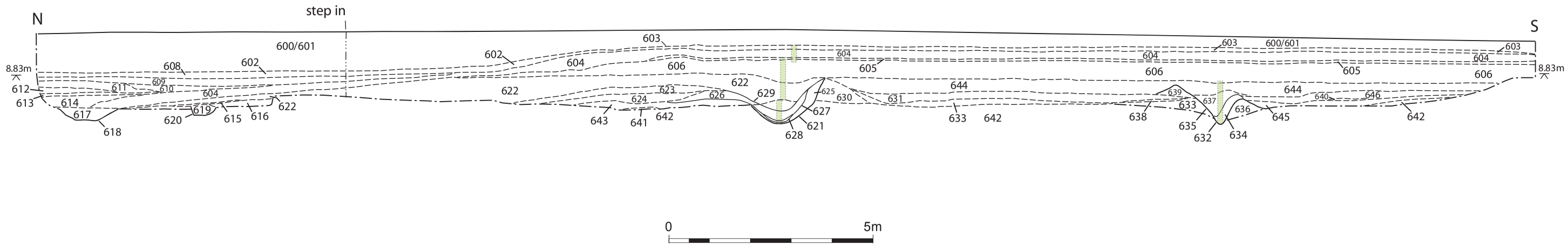
Figure 4

TRENCH 6: PLAN



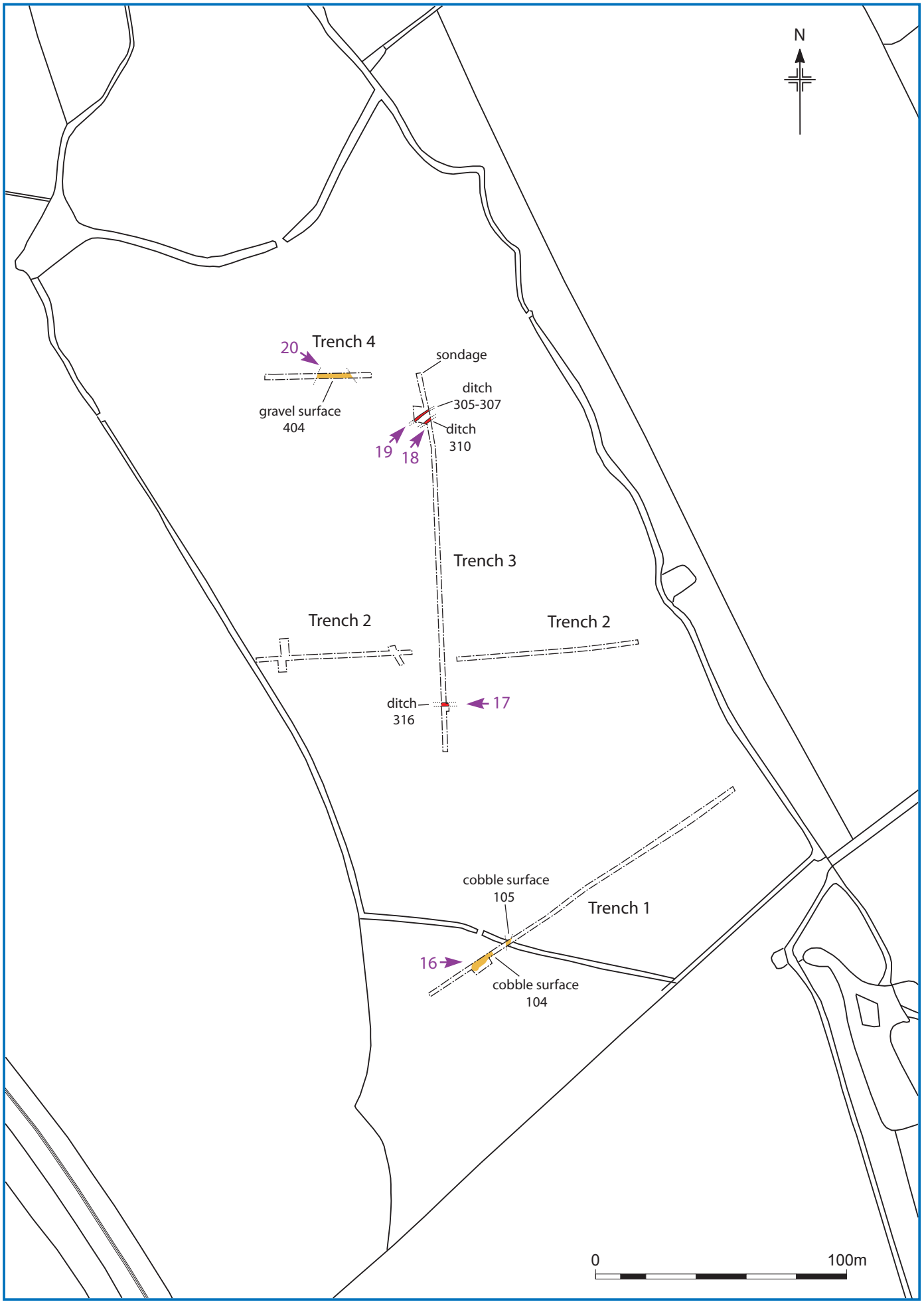


TRENCH 6: SECTION



Trench 6. plan and section.

Figure 5



Trenches 1 to 4. *Figure 6*

Plate 1: Trench 5, section 1 looking west.

Plate 2: Trench 5, pit 516 facing east.

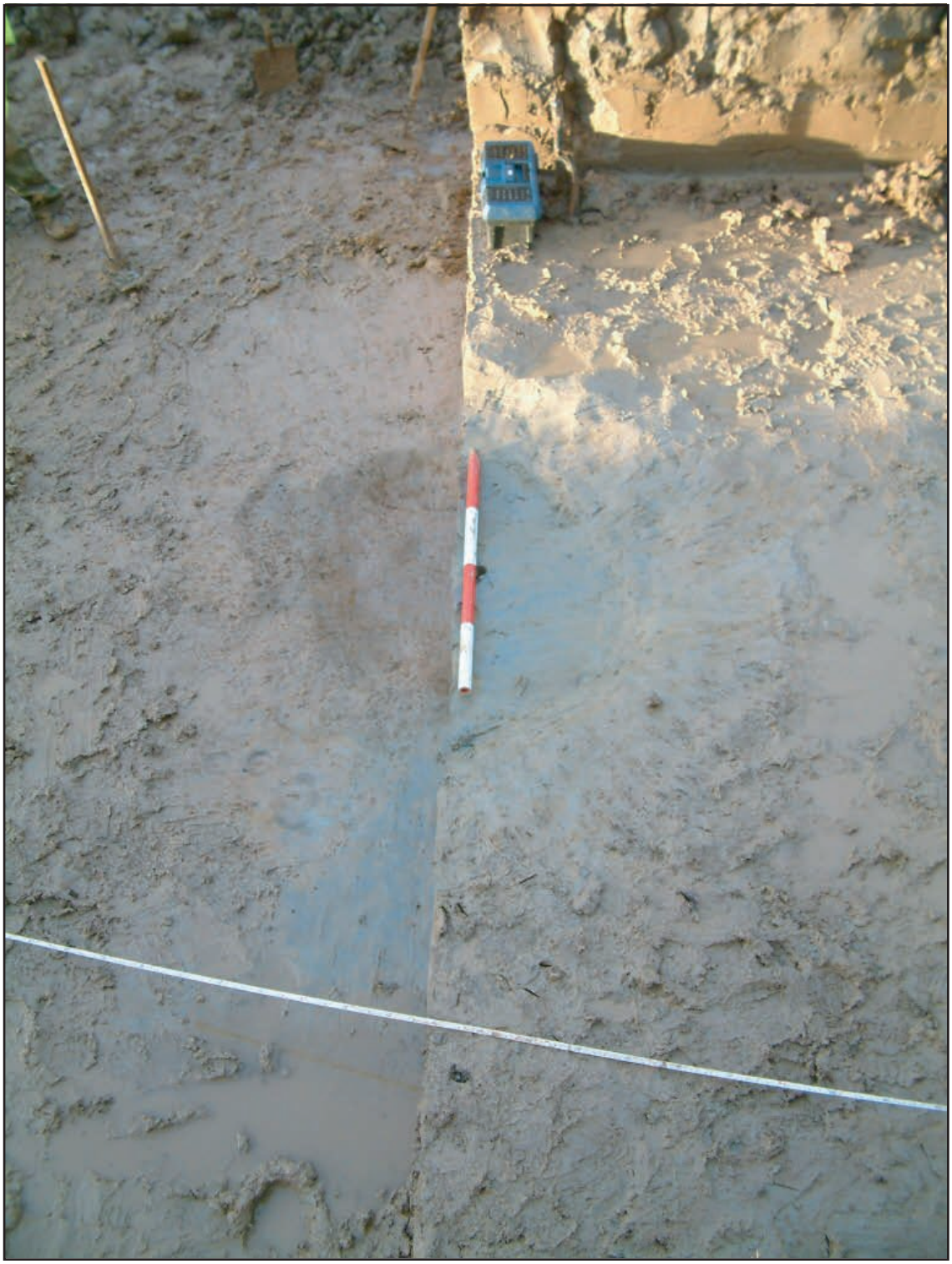


Plate 3: Trench 5, pit 516 facing north.

Plate 4: Trench 5, pit 518 facing north-west.

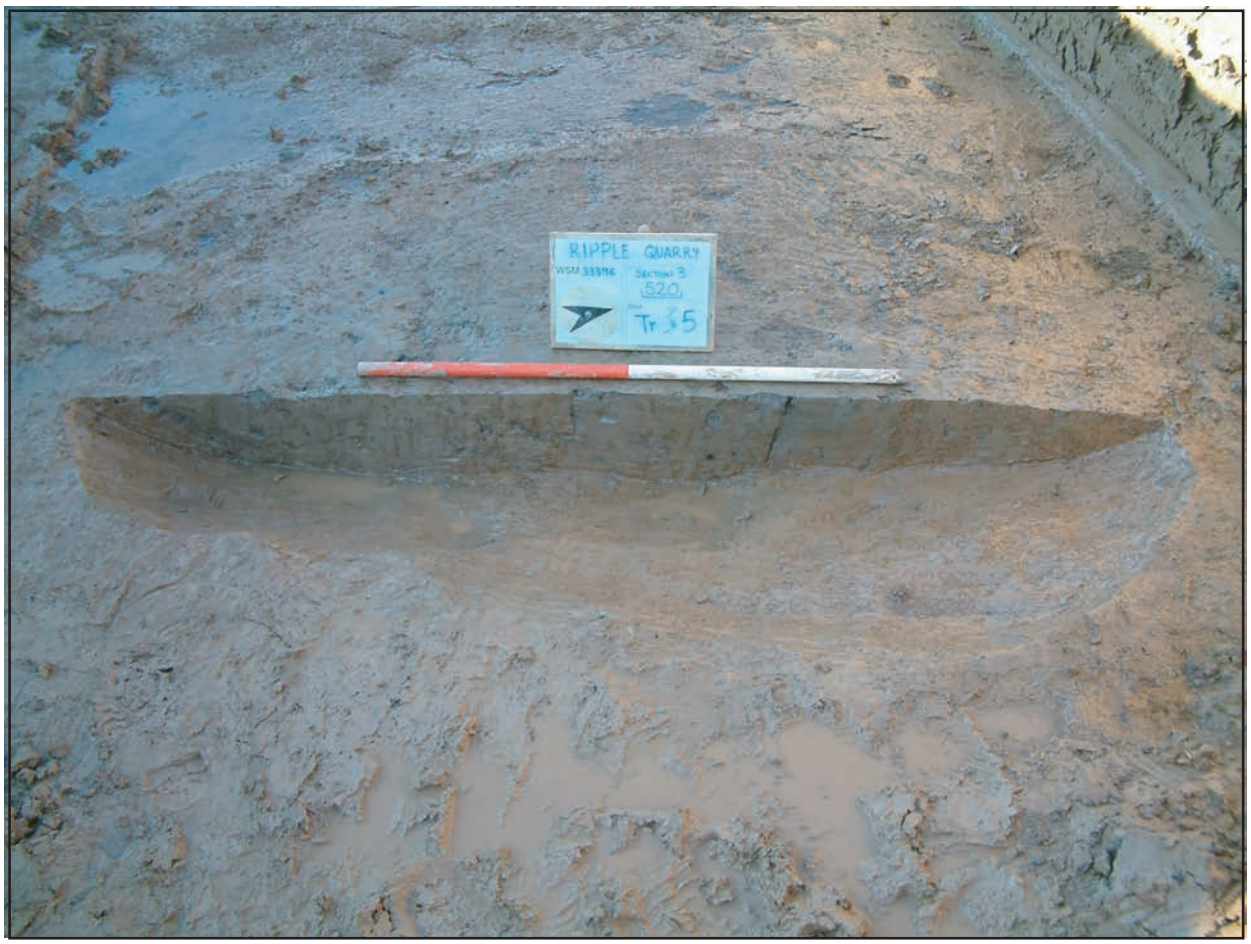


Plate 5: Trench 5, pit 520, facing west.

Plate 6: Trench 5, Timber 559, in pit 547.

Plate 7: Trench 5, part excavation of pit 547 facing north.

Plate 8: Trench 5, post excavation pit 546.

Plate 9: Trench 5, pit 538.

Plate 10: Trench 5, pit 554 pre-excavation.

Plate 11: General view of Trench 5 facing east.

Plate 12: General view of Trench 6 facing south-east.

Plate 13: General view of deposits at north end of Trench 6.

Plate 14: Trench 6, ditch 621 facing east.

Plate 15: Trench 6, ditch 632 facing east.

Plate 16: Trench 1, gravel surface 104 looking east .

Plate 17: Trench 3, ditch 316 looking west .

Plate 18: Trench 3, north-east section of ditch 310.

Plate 19: Trench 3, south-west section of ditch 305.

Plate 20: Trench 4, gravel surface 404 looking south-east.

Appendix 1 Deposit descriptions

Trench 1

Context number	Description	Depth	Interpretation
101	Friable dark greyish brown silty clay with common small roots and rare small gravels	0.00-0.40m	Topsoil
102	Compact mid greyish-orange loamy clay with very rare, fine manganese (Mg) flecks, rare fine roots, orange flecks of iron oxide and mottles of grey silty clay (from the topsoil)	0.40-0.50m	Subsoil
103	Cleaning layer above surface 104	0.50-0.55m	
104	Compact dark reddish-grey clay silt with occasional brick and tile fragments and occasional small to large various stones (sub-angular and sub-rounded). Some brick and tile fragments show residual heat and soot-like marks	+0.55m	Unexcavated gravel surface
105	Compact mid reddish-brown clay silt. See 104 for inclusions.	+0.55m	Linear feature thought to be part of the system of field boundaries from the C18th. Unexcavated, but probably similar in shape and depth to the extant ditches delineating the field today
106	Compact reddish brown clay silt with fine roots and rare sub-angular stones and very rare brick fragments	+0.55m	Probably the natural soil with some intrusion from the activity surrounding 104 and 105

Trench 2

Context number	Description	Depth	Interpretation
201	See 101	0.00-0.40m	See 101
202	See 102	0.40-0.50m	See 102
203	Friable light grey silty clay with rare, fine roots	0.50-0.53m	Fill of possible posthole 204
204	A very shallow, bowl-shaped feature	0.50-0.53m	Cut for a possible posthole. Half-sectioned and found to be not real
205	Friable patchy light reddish-brown silty clay with dark organic patches	0.50-0.56m	Fill of a possible posthole 206
206	An uneven shallow feature with diffuse edges	0.50-0.56m	Cut for a possible posthole. Half-sectioned and found to be not real.

Trench 3

Context number	Description	Depth	Interpretation
300	Soft mid to light greyish-brown clay silt with common fine roots. Diffuse lower boundary	0.00-0.32m	Topsoil
301	Firm mid to light reddish-brown clay silt with few fine roots. Diffuse lower boundary	0.32-0.41m	Subsoil
302	Firm mid reddish-brown silty clay with rare Mg flecks towards the base of the deposit. Diffuse lower boundary. All features cut this deposit	0.41-0.65m	Subsoil
303	Firm mid greyish-brown clay silt with common Mg flecks. Diffuse lower boundary	0.65-0.85m	Subsoil?
304	Firm mid greyish-red clay silt with common Mg flecks. Diffuse lower boundary	0.41-0.58m	Upper fill of ditch 305, same as 306
305	Shape of profile taken from section 12C. The south east edge is initially steep to 0.08m then breaks gradually to a moderate slope. Break of slope to base is concave and the base itself is convex. The north-west edge slopes moderately from the ground surface to the base. The break of slope to the base is concave	0.41-0.68m	East-west ditch cut. Same as 307
306	See 304	0.41-0.63m	Upper fill of ditch 307. Same as 304
307	Shape of profile taken from section 12A. The south-east edge is initially steeply sloping then breaks gradually to a gentle slope and a concave base. The north-west side has a similar profile but is slightly steeper overall	0.41-0.68m	East-west ditch cut. Same as 305
308	Soft mid reddish-brown clay silt with rare Mg flecks and rare fine roots. The lower boundary is diffuse and the context as a whole is almost indistinguishable from the surrounding alluvium 302	0.41-0.68m	Upper fill of ditch 310
309	As 308 but more grey, and has a higher clay - silt ratio. Very rare Mg flecks. Diffuse lower boundary	0.68-0.75m	Primary fill of ditch 310
310	Both edges are concave and slope steeply to the shallow, concave base. Both breaks of slope to the base are gradual and concave, with the north-west slightly more oblique	0.41-0.75m	East-west ditch cut

Context number	Description	Depth	Interpretation
311	Firm mid brownish-red clay silt with rare Mg flecks and rare fine roots. Diffuse upper horizon	0.63-0.68m	Primary fill of 307. Same as 312
312	See 311	0.58-0.68m	Primary fill of 305. Same as 311
313	Hard mid brownish-grey mottled silty clay	0.39-0.54m	Upper fill of ditch 316
314	Hard mid orange-brown mottled silty clay	0.54-0.65m	Mid fill of ditch 316
315	Hard mid greyish-brown mottled silty clay with frequent Mg flecks	0.65-0.90m	Primary fill of ditch 316
316	The south edge slopes fairly steeply and forms a concave base. The north edge has a shallow convex slope initially, then becomes concave and meets the base almost imperceptibly	0.39-0.90m	East-west ditch cut

Trench 4

Context number	Description	Depth	Interpretation
400	Machining layer	0.00	
401	Friable dark greyish-brown silty clay with very rare small sub-angular and sub-rounded gravel, very rare small post-Medieval pottery sherds and common fine roots	0.00-0.40m	Topsoil
402	Compact mid greyish-orange loamy clay with very rare small Mg flecks, rare fine roots and mottles of grey silty clay. Also flecks of orange iron oxide	0.40-0.50m	Subsoil
403	Cleaning layer above gravels 404	0.50-0.52m	
404	Soft mid brownish-red clay silt with abundant gravels, frequent Mg flecks and very rare sub-rounded cobbles	0.50-0.65m	Gravel layer
405	Compact mid reddish-brown silty clay with rare Mg flecks and small fine roots	0.60-0.80m	See 407
406	Soft mid reddish-grey silty clay with very rare Mg flecks and gravel and evidence of past root activity	0.60-0.90m	A naturally(?) occurring alluvial deposit underlying gravel layer 404
407	See 405	0.60-0.75m	Clay-based alluvial deposit underlying gravel layer 404
408	Firm mid orange-grey silty clay with rare Mg and organic flecks	From 0.90m	Alluvial layer affected by seasonal water-logging

Trench 5

Context number	Description	Depth	Interpretation
501	Loose light brown silty clay loam with common fine roots	0.00-0.15m	Topsoil
502	Soft light grey-brown silty clay with common fine roots	0.15-0.30m	Subsoil
503	Firm light blueish-grey silty clay with light reddish brown patches of silty clay and common well-sorted roots	0.30-0.50m	Alluvial deposit
504	Hard light brownish-red silty clay with fairly sorted Mg flecks and frequent well-sorted roots	0.50-0.75m	Alluvial deposit
505	Firm mid greyish-blue silty clay with well-sorted frequent roots. A light orange-brown mottling with Mg flecks occurs at the base of this deposit	0.75-0.95m	Alluvial deposit
506	Firm fine mid blueish-grey silty clay with frequent well-sorted roots and very rare Mg flecks	0.95-1.05m	Alluvial deposit
507	Firm mid orange-brown silty clay with abundant well-sorted roots	1.05-1.25m	Alluvial deposit
508	Firm mid yellowish-blue mottled silty clay with frequent Mg flecks	1.25-1.30m	Alluvial deposit
509	Hard mid greyish-brown mottled silty clay with rare Mg flecks and rare roots	1.30-1.35m	Alluvial deposit
510	Hard mid orange-brown mottled silty clay with frequent roots and Mg chunks	1.35-1.50m	Alluvial deposit
511	Hard light greyish-brown mottled silty clay with frequent roots and occasional Mg flecks	0.50-0.60m	Alluvial deposit
512	Hard light reddish-brown silty clay with frequent small roots and rare Mg flecks	0.60-0.75m	Alluvial deposit
513	Hard mid brownish-grey silty clay with frequent small roots and occasional Mg flecks	0.75-2.00m	Alluvial deposit
514	Firm mid brownish-red silty clay with occasional small roots, rare Mg flecks and rare rounded gravel	2.00-+2.10m	Alluvial deposit

Context number	Description	Depth	Interpretation
515	Firm light greenish-blue mottled silty clay with rare small twig or branch remains and very rare fine roots. Mottled in the lower half of the deposit. Truncated on the southern side by 540	1.35-1.71m	Alluvial fill of small, shallow pit 516
516	Even concave north side leading to a shallow concave base. South edge truncated by 540	1.35-1.71m	Small shallow pit possibly part of an east-west alignment
517	Hard mid blueish-brown fine silty clay	1.35-1.50m	Fill of small pit 518
518	Shallow oval pit with concave sides (70-80°) and a flat base	1.35-1.50m	Small pit, possibly part of an east-west alignment
519	Firm light grey-blue silty clay with occasional roots	1.35-1.55m	Alluvial fill of pit 520
520	Oval feature with shallow concave sides and base	1.35-1.55m	Shallow pit, possibly part of an east-west alignment
521-536	Void		
537	Firm light brownish-grey silty clay with a few small vertical twigs/branches	1.35-1.45m	Fill of pit 538
538	Small sub-oval feature breaking gradually from the surface with variable degrees of slope	1.35-1.45m	Small, shallow pit
539-545	Void		
546	Feature number. Firm dark grey alluvial clay with abundant roots, rare sand and occasional gravels. Irregular sides and a concave, rounded base	1.35-1.95m	Tree throw
547	Sheet missing		
548	Feature number. Irregular shape.	*c*1.35-1.95m	Probable tree throw. Not excavated
549	Firm light greenish blue silty clay with rare Mg flecks or wood remains concentrated on the eastern edge	*c*1.35-1.95m	Probable tree throw. Not excavated
550	Void		
551	Firm light greyish-blue silty clay with occasional Mg flecks and wood remains	*c*1.35-1.95m	Probable tree throw. Not excavated
552	Void		

Context number	Description	Depth	Interpretation
553	Compact dark greyish-brown silty clay with frequent roots	*c*1.35-2.10m	Fill of unexcavated probable tree throw
554	Unexcavated feature	*c*1.35-2.10m	Probable tree throw
555	Feature number. Firm dark greyish-brown silty clay with frequent medium roots and Mg flecks	*c*1.35-2.10m	Unexcavated probable tree throw

Trench 6

Context number	Description	Depth	Interpretation
600	Loose dark brown silty loam	0.00-0.30m	Topsoil
601	Firm mid brownish-grey silty clay	0.30-1.25m	Subsoil
602	Compact light blueish-grey silty clay	0.50-1.15m	Alluvial deposit
603	Compact light brown silty clay with frequent Mg flecks, charcoal and organic silts. Mottled	0.35-0.45m	Alluvial deposit as a stable buried land surface on the banked area 608
604	Compact light to mid brown silty clay	0.30-1.85m	Alluvium washed out from a channel to form a bank
605	Compact dark brown silty clay with abundant charcoal and evidence of past root activity	0.62-0.76m	Similar to 603. Represents a buried land surface and therefore a period of relative stability of sediment
606	Firm light brown silty clay with occasional Mg flecks and occasional charcoal	0.65-1.30m	Banked alluvial layer representing a period of stability
607	Superseded by 623		
608	North-east – south-west alignment. Convex section with a flat top	0.30-1.84m	A group number containing structural layers 603, 604, 605, 606, 622, 615 and 616. The structure number for a causeway or naturally banked material
609	Compact reddish-grey silty clay with abundant organic remains	1.3-1.33	Organic alluvial layer within a shallow depression showing settling of organic material in waterlogged conditions
610	Compact dark greyish-blue alluvial clay	1.25-1.46m	Anaerobic alluvial deposit settled into a small depression
611	Compact light brown alluvial and organic silts	1.15-1.48m	Mixed deposit. Material that has either washed out from a channel or eroded from an old surface and mixed with alluvial clay

Context number	Description	Depth	Interpretation
612	Firm light blueish-grey alluvial clay	1.30-1.46m	Alluvial layer settled into a shallow depression
613	Firm reddish grey silty clay with evidence of past root activity	1.45-1.55m	Possibly representing an old top or subsoil. Similar to 609
614	Firm mid yellowish-brown silty clay with rare Mg flecks and evidence of past root activity	1.52-1.83m	Primary deposit filling shallow depression north of banked materials 608
615	Compact dark grey silty clay	1.66-1.84m	Thin deposit of alluvium north of the shallow depression
616	Soft mid reddish-brown silty alluvium with small poorly sorted gravel and moderate flecks of degraded gravel	1.80-+1.89m	Banked alluvial material at the northern end of group 608. This deposit lies at the base of Trench 6 and may be thicker than recorded here
617	Compact dark purplish-grey silty clay with evidence of past root activity and abundant organic remains	1.80-2.15m	Fill of tree throw 618
618	Irregular sides and base with gentle breaks of slope	1.80-2.15m	Tree throw
619	Compact dark purplish-grey silty clay with frequent small to medium roots	1.77-2.05m	Fill of small tree throw 620
620	Sharp, irregular sloping sides with an irregular base	1.77-2.05m	Tree throw. Possibly contemporary with 618
621	Imperceptible break of slope with shallow straight sides. Imperceptible break of slope to a concave base	1.15-2.30m	East-west linear. Original cut of a boundary ditch associated with a trackway linking nearby Towbury Hillfort with the River Severn
622	Compact mid brown silty clay with frequent Mg and charcoal flecks	1.05-+1.99m	Organic alluvial material visible along most of Trench 6. It has built up over ditch 621 and filled re-cut 629. Extends below the limit of excavation. Equivalent to 644
623	Compact reddish brown sandy clay with frequent small angular gravel	1.39-1.80m	Layer of embanked material cut by the latest re-cut of 621. It is possible this has banked up against a low external bank

Context number	Description	Depth	Interpretation
624	Compact dark brownish grey alluvial clay	1.50-1.83m	Material embanked against the north side of 626. Deposited during flooding
625	Compact red sandy clay	1.20-2.30m	Primary fill of ditch 621 apparently slumped from bank 630. Truncated by 628 when the ditch was re-cut.
626	Firm dark grey silty clay with occasional flecks of charcoal and Mg. Clearly defined	1.43-2.22m	Alluvial deposit which overlies 643 and fills re-cut 628
627	Loose reddish-brown sandy clay with abundant gravel and sand	2.03-2.26m	Primary fill of first re-cut of ditch 621, consisting of eroded 625
628	Gentle break of slope to concave edges with a gentle concave base. Filled by 626 and 627	1.15-2.30m	East-west linear ditch cut, re-cut through 625. A re-working of original ditch 621
629	Break of slope from surface initially gentle with moderate (35°) slightly concave sides. The south side is steeper and deeper. Filled by 622	1.43-1.99m	Interface between fill 626 and deposit 622 (originally thought to be a secondary re-cut of ditch 621)
630	Loose red silty clay with abundant gravel	1.15-1.79m	A bank of natural gravel, upcast from the initial excavation of ditch 621. Aligned east-west. A southern (internal?) bank for this ditch? Note: no associated buried land surfaces
631	Firm dark grey silty clay with rare charcoal and Mg flecks. Clearly defined edges. Banks up to 630 and overlies deposits associated with ditch 632	1.26-1.79m	
632	East-west V-shaped linear. Steep, straight sides and a sharp break of slope to the base. Truncated by 635 to the north	1.52-2.16m	Linear east-west ditch, possibly contemporary with 621. See 621
633	Firm reddish-brown sandy clay with rare fine sand and gravel	1.41-1.99m	Alluvial layer associated with ditch 632 and equivalent to 645
634	Firm reddish-brown sandy clay with occasional gravels and a gritty texture	1.41-2.16m	Single fill of 632 truncated by re-cut 635. An alluvial infilling rather than a deliberate backfill

Context number	Description	Depth	Interpretation
635	East-west linear feature with moderate (45°) sides which are convex at the top and concave at the base. The base itself is U-shaped. Truncates 634 and 633	1.41-1.98m	Re-cut of ditch 632, possibly contemporary with 629 as both cut a similar layer (631 and 626)
636	Loose reddish-brown silty clay with abundant sand and gravel	1.52-2.07m	Upcast from ditch 632 forming a low, wide bank immediately to the south
637	Firm mid brown silty clay with occasional Mg and charcoal flecks	1.31-1.98m	Alluvial fill of re-cut 635
638	Loose 20-30mm sub-rounded gravel layer in a mid grey silty clay matrix with occasional sand. A long thin layer, similar to 640	1.53-1.65m	May relate to re-cut event 625 or indicate levelling of surface 645
639	Firm dark greenish-red alluvial clay with occasional Mg and charcoal flecks. Forms a conical bank on the north side of ditch 635	1.20-1.54m	Bank or dump of upcast material from ditch 635
640	Loose 20-30mm sub-rounded gravel layer in a mid grey silty clay matrix with occasional sand. A long thin layer, similar to 638	1.46-1.54m	See 638
641	Firm light blueish grey silty clay lying at the very base of Trench 6, part of the alluvial layers dipping northwards	1.89-+1.99m	Alluvial layer obscured by rising water levels and the disturbance of deposits at the base of the trench
642	Loose reddish-brown silty clay with abundant small sub-rounded river gravel and large patches of coarse sand	From 1.39m	Natural gravel
643	Compact mid reddish-brown sandy clay with occasional gravel truncated by 628	1.70-1.99m	Alluvial layer
644	See 622. Overlies southern ditch sequence 621 and 632	1.15-1.45m	Alluvial layer
645	See 633. Lies south of ditch 632	1.64-+1.75m	Alluvial layer
646	See 631. Lies south of ditch 632	1.24-1.62m	Alluvial layer

Appendix 2 The radiocarbon date

The University of Waikato

Radiocarbon Dating Laboratory

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Report on Radiocarbon Age Determination for Wk- 14296

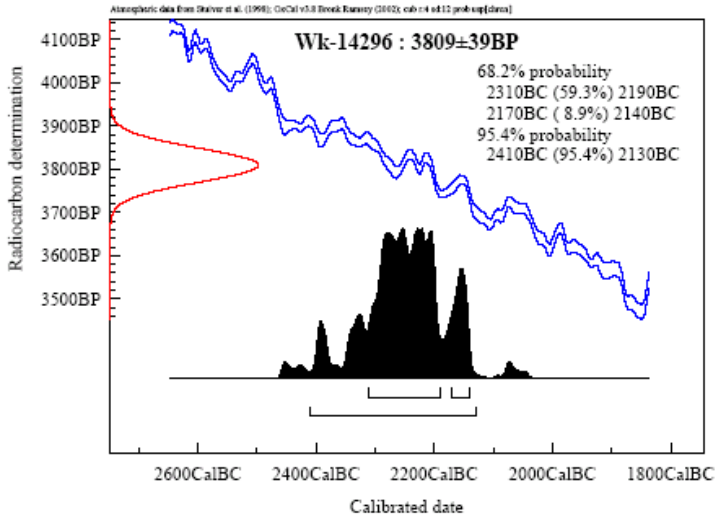
Submitter	E Pearson
Submitter's Code	WSM33396/609
Site & Location	Ripple, Worcestershire,, United Kingdom
Sample Material	Wood
Submitter's Code	WSM33396/609
Site & Location	Ripple, Worcestershire,, United Kingdom
Sample Material	Wood
Physical Pretreatment	Surfaces scraped clean. The wood was chopped up into small splinters and washed in ultrasonic bath.
Chemical Pretreatment	Sample was washed in hot 10% HCl, rinsed and treated with hot 1% NaOH. The NaOH insoluble fraction was treated with hot 10% HCl, filtered, rinsed and dried.

$d^{14}C$	-378.3 ± 3.0	‰
$\delta^{13}C$	-25.5 ± 0.2	‰
$D^{14}C$	-377.6 ± 3.0	‰
% Modern	62.2 ± 0.3	%
Result	**3809 ± 39 BP**	

Comments

AGHogg
17/2/04

- Result is *Conventional Age or % Modern* as per Stuiver and Polach, 1977, Radiocarbon 19, 355-363. This is based on the Libby half-life of 5568 yr with correction for isotopic fractionation applied. This age is normally quoted in publications and must include the appropriate error term and Wk number.
- Quoted errors are 1 standard deviation due to counting statistics multiplied by an experimentally determined Laboratory Error Multiplier of 1 .
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB.
- Results are reported as % *Modern* when the conventional age is younger than 200 yr BP.


Wk-14296 : 3809±39BP
68.2% probability
2310BC (59.3%) 2190BC
2170BC (8.9%) 2140BC
95.4% probability
2410BC (95.4%) 2130BC
Radiocarbon determination
4100BP
4000BP
3900BP
3800BP
3700BP
3600BP
3500BP
2600CalBC
2400CalBC
2200CalBC
2000CalBC
1800CalBC
Calibrated date

TERRA NOVA

The Geoarchaeology of Deposits at Ripple, Tewkesbury

25 February 2004

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The Geoarchaeology of Deposits at Ripple, nr Tewkesbury

25 February 2004

Summary

A geoarchaeological study was carried out at to evaluate deposits from a site at Ripple nr Tewkesbury. Soils are typical alluvial gleys of the Hollington series above a fluvioglacial sand and gravel surface. The deposits were analysed to gain a better understanding of the processes involved in their depositional and post-depositional history in order to assess the potential for further analysis.

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Aims

This project aimed to evaluate the geoarchaeology of a site adjacent to the River Severn at Ripple in order to clarify the origins of the deposits and help assess the archaeological potential of the site.

Certain questions were raised during the excavation:

1. Why is there so much less alluvium in the area of trenches 3 and 4 than there is in the area of trenches 5 and 6?

2. Why are the features in trenches 2 and 4 so poorly defined when they produce such strong cropmarks?

3. In trench 5 what general trends in alluviation, stasis and post-depositional change can be identified from the various records (particularly those of the sondage)?

4. How might those general trends in trench 5 have affected the survival of man-made features? For example, the definition and depth of pit 547 suggests that it has survived intact, but pits 516/540 and 538 are much shallower and more poorly defined, suggesting a considerable loss of upper stratigraphy.

5. For trench 6 what can the records and the monoliths combined tell about the context in which the two parallel ditches (621 and 632) were excavated, re-cut and finally filled?

6. What caused the banking up of alluvium visible in the northern part of the section in trench 6? Is this related to a channel flowing along the tree-line to the east (former osier beds)?

7. To make a general assessment of the potential of the site for further work.

Scope of Report

This report is the result of a single day visit to examine sections and to collect samples for laboratory study. The site records are necessarily brief and only a small amount of preliminary analysis has been carried out in the laboratory in order to identify the potential of the deposits and construct a provisional geoarchaeological interpretation. The deposits have shown some potential to reveal more detail, a potential that has not been met in this limited investigation which has resulted only in an outline description and analysis of the deposits. This report identifies the need for further work and suggests methods of analysis which will be of value in interpreting this site.

Background

Location

The site is situated at NGR SO 868370, adjacent to the M50 to the southwest of the village of Ripple.

Geology

The British Geological Survey "*South solid 1:625,000*" and "*Tewksbury sheet 216 solid and drift edition 1:50,000 series*" show the bedrock to consist of Triassic mudstones overlain by alluvium.

Topography

The site lies on an area of flat land to the east of the River Severn at about 10m above OD.

Land Use

The site is at present in area of farmland and used for the growing of arable crops.

Soils

The site is mapped by the Soil survey of England and Wales, "*sheet 3 Midland and Western England* 1:250,000" map as lying on typical alluvial gley soils of the Hollington series.

Hydrogeology and Hydrology

The site lies on the floodplain of the River Severn where it is regularly inundated. Pedological evidence for persistent waterlogging has been found by our investigations in the form of orange mottles which have formed as the result of redoximorphism. Further evidence of continuous waterlogging in deeper sediments has been found in the form of a blue grey colour to the sediments as a result of reduction.

Method

The site was examined from sections during a day visit and samples were taken by the site archaeologists for later analysis. These samples consisted of 4 monoliths collected in plastic guttering.

Monoliths 10, 11 and 12 form a continuous sequence taken through the centre of a ditch cut, its fill and the overlying alluvium up to the base of the subsoil, from an east facing section midway along trench 6. Monolith 10 at 75cm in length contains the lowest section of the sequence, monolith 11 at 100cm in length contains the middle section of the sequence and monolith 12 at 45 cm in length contains the uppermost part of the sequence. Monolith 23 was also taken through a ditch cut, its fill and the overlying alluvium to the base of context 606, from the east facing section at the southern end of trench 6.

The monoliths contained within the plastic guttering were allowed to dry slightly then cleaned with a sharp knife to provide smooth flat surfaces to enable closer inspection of finer detail not visible in the sections on site. Magnetic susceptibility readings were taken every 5cm up the sequence using a Bartington MS2 meter and type F field coil.

Observations

Examination of the sediments in the trenches showed them to be Devensian sands and gravels overlain by sandy and silty fluvial Holocene deposits. Magnetic susceptibility values were low and typical of natural Holocene alluvial deposits in this area. It was observed that in trenches 3 and 4 to the north of the site there was considerably less alluvium overlaying the natural gravels when compared to the depth of alluvium in trenches 5 and 6 in the south of the site. In some areas well preserved wood and other materials were found in waterlogged conditions that had prevented their decay.

In trench 3 there was about a metre of alluvium overlaying the natural gravels, the first 30 – 40 cm consisted of a grey-brown silty clay loam containing black manganese concretions and orange mottles indicating persistent water logging. Magnetic susceptibility readings varied between 4 – 18 SI. Above this the brown silty clay loam had a prismatic structure changing to blocky near the surface where the effect of ploughing was evident. Very fine roots were found and magnetic susceptibility readings were between 4 – 12 SI with the higher readings of 8 – 12 SI at the surface.

Ditch features were noticed at the base of trench 3 when it was excavated. The features were very poorly defined and difficult to see and it was very unclear as to the context from which the ditches may have originally been cut. These features were thought to relate to strong cropmarks on air photographs of the site.

In trench 4, as in trench 3, it was observed that there was about a metre of alluvium between the gravels and the topsoil. The first 60 cm were light grey in colour and silty clay loam in texture containing occasional very fine roots and dark organic patches. Manganese oxihydroxide concretions were observed together with orange mottles indicating persistent waterlogging. Magnetic susceptibility readings taken in the field measuring 7 – 8 SI were consistent with natural background readings. Towards the top of this unit a thin moderately well sorted gravel layer was observed. This was not an extensive feature and appeared to cover the area of a shallow depression. It was suggested on site that this may well have been deliberately deposited. There were no apparent artefacts within this layer and magnetic susceptibility readings were 9 – 12 SI at the top of the layer. The upper 40cm consisted of a light brown silty clay loam with a blocky structure with the effect of ploughing evident down to 30cm from the surface. Magnetic susceptibility readings were between 7 – 10 SI.

For the sediments in trench 5, analysis was only possible by examination of the records and photos taken by the archaeologists as it was not possible to examine the trench on the day of the visit. This has limited the conclusions that may be drawn regarding the processes involved during and after deposition of the alluvium. From these records it appears that trench 5, which is located at the southern end of the site, has about 2m of alluvium overlying the gravels while the trenches in the northern part of the site have only about 1m overlying the gravels.

From a sondage in the eastern end of trench 5 a drawing was made of an east-northeast facing section in which the excavators have identified 2m of alluvial silty clays. The lower third was a silty clay with gravel at the base. Colour was mainly orange-brown with evidence of mottling with manganese flecks and concretions. Roots were described as frequent and the sediment appeared to be well sorted with no stones. The middle third was heavily orange mottled and grey in colour, described as having occasional manganese flecks and frequent well sorted organic remains. The upper third consisted of a light brownish-red turning to light bluish-grey coarse silty clay.

There was evidence of reduction and mottling, and organic remains were recorded as frequent and well sorted but poorly preserved. Further examination by the excavators has shown that the poor preservation had significantly reduced the potential for palaeoenvironmental analysis. The upper 30cm consisted of the subsoil and topsoil. All horizons were very diffuse and pedogenesis was evident throughout the profile.

Various man-made features were observed within trench 5. Pit 547 the base of which was recorded at a depth of 7.79 OD was described as well defined and contained a well preserved piece of wood. Whereas pits 516, 540 and 538 were described as shallower and much less well defined. A sample of the wood found within trench 5 (WK-14296) was dated to 2410 – 2130 cal B.C. The depth of the pit compared to its width suggests that this is the result of human activity rather than a naturally formed depression.

The strong variations in colour in the sondage section appear to be the result of changes in the colour of the alluvium being deposited across the valley onto which have been superimposed the effects of subsequent reduction and oxidation. Two grey, reduced bands stand out and may represent strata in which organic matter has accumulated – either by redeposition or by in-situ pedogenesis and plant growth – providing an organic substrate for reducing biota to act on the deposit. If this is the case then the section tells us that there have been phases of organic accumulation, probably under wetter conditions or periods of slower accumulation, and of organic decay, under drier but not fully aerobic conditions, for which evidence is now only available as these secondary indications. Further study is likely to clarify the sequence of events which these strata represent. The presence of mineral stratification derived from changing parent sources is not surprising since this has been previously recorded and discussed for the Severn valley. The clarity of the change, however, indicates that further study may provide evidence of the way in which the valley has evolved.

Trench 6 situated at the southern end of the site consisted of gravels overlain by around 2m of alluvial silts and clays. Four monoliths were taken from this trench, monoliths 10, 11 and 12 contained a continuous sequence through the northernmost ditch of two parallel ditches that appear to run from roughly east to west. Monolith 23 was taken through the southern ditch.

Monoliths 10 – 12 were taken through a sequence of deposits at about 9m OD starting with fluvial glacial sands and gravels passing through an archaeological ditch which appeared to have been re-cut sometime in antiquity then the overlying alluvial sediments. Above the natural gravels there was 15cm of a red loamy sand containing sub-angular stones with a diffuse upper boundary. The 130 cm above this were a mid brown silty clay loam with patches of sandy clay loam.

It was difficult to discern the boundaries between the ditch fills and the overlying alluvial sediments. Fine root pores could be seen throughout along with dark patches of concretions and occasional pale yellow sandy concretions. Deposits immediately above this were heavily mottled by hydrated iron oxihydroxide representing reduction and oxidation due to persistent waterlogging within the profile. This suggests that the water table has remained high throughout these deposits since they were laid down, but not to the extent that worm action and rooting hasn't been able to take place. The 20cm above this were heavily flecked with manganese and contained fine root pores. The upper 35cm of monoliths 10 – 12 were also a mid brown silty clay loam containing fine root pores, manganese concretions together with dark and orange mottled patches. Pedogenesis was evident and fissures could be observed from prismatic structure.

The deposits of the ditch fill appear poorly sorted Magnetic susceptibility readings for all three monoliths ranged between 5 – 10 SI and are consistent with natural background values. There was little evidence of archaeological artefacts with just the occasional small piece of charcoal.

Monolith 23 taken through the southern ditch and throughout its 95cm length consisted of a silt clay loam occasionally becoming slightly sandier and red brown in colour. The sediment contained occasional stones varying from sub-angular to round and was poorly sorted indicating that the fill was the result of dumping or slumping rather than deposition within moving water. Flecks of manganese and darker patches of concretions were evident throughout the monolith indicating prolonged waterlogging. Disturbance by later rooting and possible faunal pores would have further destroyed any boundaries between layers such as the ditch fills and the overlying alluvial sediments. Magnetic susceptibility readings were between 6 and 13 SI and were consistent with normal background values.

Discussion

The site is a complicated palimpsest of features both natural and archaeological above a fluvioglacial sand and gravel surface. The deposits broadly indicate that at the close of the Devensian fluvioglacial deposition was followed by fine mineral alluviation in the valley bottom through the Holocene. The deposition of these alluvial sediments would have gradually filled depressions within the undulating gravel surface. As flood waters rose and covered the valley bottom, depressions within the gravel surface would have inundated to greater depths by water containing a greater amount of suspended sediment. A greater depth of alluvial deposition would then have occurred over these depressions compared to higher areas of the fluvioglacial surface, eventually resulting in a flatter floodplain.

The sediments are characterised by mottling and the effects of chemical reduction indicating prolonged waterlogging, but not to the extent that pedogenesis, worm and root action have been completely excluded, especially from the surface soils which will have remained drier than the deposits below through the drier months of each year.

The deposits within the ditches were poorly sorted and heavily disturbed by rooting and soil biota. These ditches are therefore likely to have been filled by dumping and slumping rather than by deposition by stream flow.

The excavation found that there appears to be less alluvium over the gravels in the north than the south of the site and observations made during the excavation suggested that this is because the gravel surface rises from south to north. The existing borehole records for the site show, however, that this rise is complicated by more local undulations, including some significant depressions. This is important in our interpretation of the archaeological evidence and the planning of future research since the form of the underlying fluvioglacial surface will probably be reflected in the nature of the evolving Holocene surface above and, therefore, in the ways in which that surface determined the mosaic of environments across the valley and resources for past societies to exploit.

The features observed in excavation in trenches 3 and 4 in the north were poorly defined and difficult to discern and yet according to the archaeologists had produced strong cropmarks. The upper parts of the cuts of the features have been heavily disturbed by worm and root action and other soil formation processes, especially lessivage (the downwards movement of fine matter in suspension). The fills are difficult to distinguish from the sediments into which the ditch was cut. Both the ditch fills and the surrounding sediments show evidence of mottling by hydrated iron oxihydroxide representing reduction and oxidation due to persistent waterlogging within the profile. Although similar in appearance, the nature of the ditch fills are different enough from the surrounding sediments into which the ditches are cut to affect the growth of crops above. The lower fills, in particular, are of different textures to their surroundings and are likely to have affected the ability of plant roots to extract water from the soil in different ways, leading to variations in growth and maturation.

There is no evidence to suggest that there was any extended periods of stasis, represented by palaeosol surfaces, between periods of alluvial deposition, and there were no increased readings of magnetic susceptibility to suggest a buried surface. However throughout the profile the rate of alluviation was slow enough to allow root and soil organisms to mix the upper profile and thus destroy any fine alluvial stratigraphy deposited in floods. The excavators recorded the presence of organic remains, which proved, on further analysis to be poorly preserved. The presence of redoximorphism show that there was prolonged waterlogging within the profile.

In trench 5 the post-depositional processes mentioned above have caused the loss of definition to the shallower features whereas deeper features such as pit 547 are far less susceptible to those processes, because waterlogging has been more persistent, and features have therefore survived in a better state of preservation. The piece of wood found in the base of pit 547 has been dated to 2410 – 2130 cal B.C. which places it within the late Neolithic to Beaker period.

The two parallel ditches exposed in trench 6 are both cut into and have an upcast deposit on the underlying gravels. Layers identified on site suggest that the ditches have been re-cut at least once in antiquity with the last cut removing all evidence of previous fills. Both ditches are then subsequently overlain by alluvial sediments which, it has been suggested, had been banked up towards the southern end of trench 6. Our observations on site, however, suggest that this accumulation is natural, rather than anthropogenic and, although the evidence is weak, it appears to relate to flooding from the main river channel rather from subsidiary drainage. Further studies of the mineral suites may, however, resolve this question.

Conclusions

The site consists of mainly fine-grained alluvia, derived from the diverse geology of the Severn catchment upstream and deposited in flood over a fluvioglacial surface rising – with undulations – from north to south and eastwards, inland from the river.

These deposits have been variously altered by human activity and further altered by lessivage and redoximorphism under persistently wet conditions. The alluvia have been well mixed throughout by soil forming processes, indicating that flood episodes were not able to bury any incipient palaeosols under new alluvium, beyond the reach of surface soil processes. This implies that, while deposition may have been episodic, the episodes were not extremely rare events, each contributing a high proportion of the alluvial accumulation. Instead it seems more likely that even the deepest alluvial accumulations reached no more than a few centimetres since subsequent pedogenesis has been able to entirely destroy any sedimentary structure.

Some depositional evidence does, however, survive as broad changes in the particle-size distribution and variations in mottling which may reflect brief palaeosol development. Further study of the deposits may therefore tell us more both about the source of the sediment – and thus the history of erosion upstream – and the processes by which the alluvia were deposited.

Such evidence will not, however, be precisely dateable because of the degree of pedogenetic mixing and the loss of precise stratigraphic associations between the archaeological features and their sedimentary context.

It is likely that the loss of this stratigraphic detail, through redoximorphic colouring and lessivage will be common to the whole site although micromorphological study of the feature fills and their surrounding deposits may identify variations which survive and which may therefore be used to trace boundaries even where they are not immediately visible.

Some evidence of the sedimentary history of the valley floor appears to survive as buried terrace surfaces, which complement those exposed. Thus a broader and fuller study of the whole sedimentary profile across and along the valley may provide crucial evidence of the Holocene valley evolution to parallel those of the Trent, Thames and other major river systems across the country, allowing us to put the archaeological history of the site into its wider landscape context.

This might, most efficiently be carried out by a combination of a broad electromagnetic conductivity survey and electrical resistance tomography, to map the changing bedrock depth and palaeochannels, followed by a carefully targeted survey in which intact cores are recovered for laboratory recording and palaeoenvironmental analysis. These data can then be combined to provide a detailed three-dimensional computer model of the deposits over a wide area which can then guide excavation.

The depth of the alluvium and the lack of magnetic susceptibility contrast between the fills and alluvial contexts of the archaeological features encountered at this site explain why the magnetometer survey was ineffective. These same factors mean that it is similarly unlikely that more sensitive magnetometers or other instruments will produce better results (since textural and electrical contrasts are likely to be similarly lacking) and there may be no way for geophysics to successfully map the buried features themselves.

Very detailed electrical resistance tomographic survey might detect the very largest features but this is only likely where they penetrate the underlying fluvioglacial deposits which have very different hydrological and physical characteristics to the alluvia above.

Further Study

It is unlikely that we will be able to recreate a very detailed stratigraphic history of the site because of the destructive effects of redoximorphism, bioturbation and lessivage. Further geoarchaeological survey and study are likely, however, to be worthwhile because there is evidence in the broad and detailed structure of the deposits which represents the general history of alluvium sources, deposition and post-depositional change.

We recommend, in particular, that a combined geophysical and coring survey be used to create a 3-Dimensional stratigraphic model over a wider area, in order to guide future, more specific investigations, and that a combination of textural, micromorphological and mineral analyses be used to investigate the fine structure of the deposits and their mineral constituents.

A Note on the Identification of Environmental Evidence: This report is the result of a geoarchaeological study of the mineral and organic deposits and soils. In the course of examining the deposits pollen, diatoms, and other forms of environmental evidence are occasionally found and recorded. However, the samples have not been prepared specifically for the recovery of these materials and no attempt at species identification has been made. This report is not intended to be, and should not be used as, a substitute for full pollen, diatom and other environmental assessments made by suitably qualified specialists. The aim of this report is rather to comment on the nature of the deposits themselves and as contexts for the survival of archaeological and environmental information, to provide relevant information to the other specialists.

Appendix 1: The Meaning of Magnetic Susceptibility

Magnetic susceptibility (χ) is a measure of the degree to which a material will become magnetised in the presence of an external magnetic field. The magnetic susceptibility of many natural soils increases slightly towards the surface. This is the Le Borgne effect (Le Borgne, 1955) and is probably caused by slight changes in magnetic mineralogy caused by the greater availability of oxygen at the surface.

Burnt soil material, domestic debris and ceramics typically have high magnetic susceptibilities. Ferrous metals have susceptibilities which are even higher. The degree to which an archaeological or natural deposit is contaminated with these materials can be determined by measuring its susceptibility, either in the field, using a small, portable detector, or under more controlled conditions in the laboratory.

Laboratory instruments also allow us to calculate the frequency dependence (fd) of the susceptibility. This is a measure of the percentage difference between the susceptibility of a sample to magnetic fields which are alternated at two different frequencies, 0.465 and 4.65 KHz – known as low frequency (lf) and high frequency (hf). respectively. Samples containing magnetic minerals of different types show different χ_{fd} values – although the interpretation of these differences is, as yet, a matter of debate. It is thought that very fine magnetic particles, derived from burning and soil formation, alter the magnetic susceptibility of samples in a way which alters with the frequency of the inducing field.

Simple studies of the relationship between particle size, particle type and susceptibility can often help us to understand how the magnetic properties of archaeological deposits arise. Such studies are easily achieved during excavation projects and may prove a valuable part of future excavation practice, especially on urban sites.

The use of magnetic susceptibility measurements is discussed in Walden, J., Oldfield, F., and Smith, J. (1999) *Environmental magnetism: a practical guide*. Quaternary Research Association, technical guide no. 6, London, pp.243.

Le Borgne, E. (1955) *Susceptibilite magnetique anormale du sol superficial.* Annales de Geophysique, **11**, 399-4

SURVEY RESULTS

2003/88 Ripple Quarry

1. Survey Area

1.1 Three predefined areas, totalling 9ha were investigated with gradiometers in scanning mode. Detailed survey, totalling 3ha was carried out in 5 sample blocks (Areas 1 to 5). The location of the survey areas is shown in Figure 1 at a scale of 1:5000

1.2 The survey grid was set out by ***GSB Prospection*** and tied in to existing boundaries with an EDM and tapes.

2. Display

2.1 Figures 2 to 9 present summary greyscale images and interpretations of the results superimposed on the basemap, at a scale of 1:1000

2.2 The results for each area are displayed as X-Y traces, dot density plots and digitised interpretations all at a scale of 1:500 (Figures 10-21). For display at this scale Area 5 has been subdivided (5A and 5B).

2.3 The display formats and the interpretation categories used are discussed in the *Technical Information* section at the end of the text.

2.4 Letters in parentheses in the text below refer to individual anomalies highlighted on the interpretations.

3. General Considerations - Complicating factors

3.1 Ground conditions were generally reasonable, the land being flat, under stubble or recently ploughed and rolled and free from obstructions.

3.2 The alluvial soils which predominate across the site are not favourable to the magnetic detection of archaeological deposits. Two factors are pertinent: the depth of overburden and the inherent lack of natural magnetism in the soils. The archaeological features and finds noted in the antiquarian evidence lie several feet beneath the current ground surface, while the presence of cropmarks in the northern half of the site would suggest a reduced amount of overburden at this location and thus a varying level of alluvium across the site. While deeply buried archaeological deposits which have a very strong magnetic enhancement (for example, those associated with industrial activity) should produce a magnetic signal detectable at the surface, smaller and / or peripheral features (pits and agricultural divisions/enclosures) might remain undetected.

4. Results of Scanning

4.1 With gradiometers in scanning mode, the selected areas were examined along traverses spaced at intervals of approximately 10m. During this operation, fluctuations in magnetic signal were observed on the instruments display panel. Any significant variations were investigated more closely to determine their likely origin and those anomalies considered to have archaeological potential were marked with canes for detailed recorded survey.

4.2 All the scanned areas were found to be very magnetically quiet, with the exception of a few isolated ferrous type responses. Very few targets of possible interest were observed. Detailed survey was positioned to cover these and provide good spatial coverage of the areas of interest.

5. Results of Detailed Survey

5.1 All of the detailed survey blocks contain small scale ferrous responses, or "iron spikes". These are characteristic of small pieces of ferrous debris (for example, horseshoe/ploughshare/tin can) scattered in the topsoil and are usually assigned a modern origin.

Area 1

This area investigates the location of a possible archaeological site noted in antiquarian records.

5.2 Possibly the most promising of all the anomalies recorded by the survey is a sub-circular anomaly (A), approximately 8m diameter, in the centre of the survey area. A group of relatively strong amorphous responses in the southwestern corner of the grid may also be of interest, though given their position next to a stream/drain, a natural origin seems more probable.

5.3 Elsewhere in this block a number of small weak pit type responses and faint trends have been highlighted. A group such responses at (B) appear to form a rectilinear pattern and this could strengthen an archaeological interpretation. Natural or modern origins for the remainder seem equally likely.

5.4 A broad amorphous linear (C), with both positive and negative elements has been recorded in the southwestern half of the grid. The form of the response would suggest a natural origin such as a former stream channel. However its linear nature would favour an anthropogenic origin. It coincides with a feature noted on LiDAR data that is clearly linear, as opposed to curving or meandering (R Jackson *pers. comm.*). It also runs parallel to an existing field boundary to the east. It seems likely that the geophysical and LiDAR data represent the same feature, which could be a former channel that has been straightened and canalised or the remains of a former boundary.

Area 2

This small sample was placed to investigate a scanned anomaly.

5.5 The scanned target appears as a relatively strong pit type anomaly in the centre of the grid. Its precise origin remains uncertain and, while an archaeological interpretation is offered, a modern one (more deeply buried ferrous debris) seems equally likely. A few other indistinct pit type responses and trends have been highlighted, but an archaeological origin for them is tentative.

Area 3

This sample was positioned to investigate the possible continuation of cropmarks noted in the adjacent field.

5.6 A number of pit type responses have been recorded in this block. They vary in strength and definition and some are barely visible above background levels. Of particular note are several which are relatively large and well defined, in the southern half of the grid. However, there are no obvious patterns to the anomalies and while an archaeological interpretation is offered, they could equally represent natural soil variations (possibly pockets of magnetic gravels deposited in the alluvium) or more deeply buried ferrous debris.

5.7 A few faint linear trends have been highlighted, but their indistinct nature makes it impossible to formulate any interpretation.

Area 4

This strip was surveyed to investigate a possible continuation of a double ditch and pit alignment noted on aerial photographs in the adjacent field.

5.8 No evidence for a continuation of the cropmark features is evident in the magnetic data. A few isolated weak pit type responses have been highlighted, for which an archaeological interpretation is tentative at best.

5.9 An area of magnetic disturbance in the northwestern corner of the grid is thought to relate to ferrous material in the adjacent boundary.

Area 5

This sample was positioned to cover scanned anomalies and provide good spatial coverage of the field which contains a number of cropmarks.

5.10 Slightly elevated levels of background fluctuation were noted both during the scan and the detailed survey; these are attributed in part to recent ploughing activity.

5.11 As with the other areas, all the anomalies of possible interest in this block are pit like in nature and vary in strength and definition. An archaeological interpretation is assigned largely on the basis of the supporting evidence, namely the cropmarks, but in the absence of any clear ditch type anomalies in the *geophysical* data, it is difficult to fully interpret the results.

5.12 Perhaps of particular interest are a group of pit type responses (D), which appear to follow a linear alignment and a curving anomaly (E). Anomaly (F) is curious: it is strong, with a negative shadow, but not specifically ferrous in nature. It may be archaeological, but a natural origin is equally probable.

5.13 An area of increased magnetic response has been recorded in the southwestern corner of Area 5B. It lies close to an old boundary/drainage ditch shown on the maps but no longer visible in the field. The anomalies could reflect material from this former ditch.

5.14 Several trends have been highlighted on the interpretation. Those that are parallel most probably reflect the current plough line, while the origin of the remainder is unclear.

6. Conclusions

6.1 No clear well defined linear anomalies suggestive of archaeological ditches have been detected by the survey. Although there are hints of a circular ditched feature in Area 1 (anomaly A) the response is indistinct. All the remaining anomalies of possible interest comprise very faint trends and pit type responses which vary in strength and definition, with many being barely discernible above background levels. Given the soils of the site (see paragraph 3.2) a low level of response for buried archaeological features is perhaps to be expected and thus even the weakest of anomalies may be significant. However the absence of obvious patterns in the results makes any archaeological interpretation tentative at best.

6.2 While the survey has provided a few possible targets for excavation it has not added significantly to the existing archaeological record. Given the nature of the site soils and in particular, the presence of alluvial overburden of varying depths, it is possible that archaeological deposits, suggested by other sources, have remained undetected.

Project Co-ordinator: C Stephens
Project Assistants: M Saunders

Date of Survey: 4th & 5th November 2003
Date of Report: 27th November 2003

References:

SSEW 1983. *Soils of England and Wales. Sheet 3, Midland and Western England.* Soil Survey of England and Wales.

SITE SUMMARY SHEET

2003/88 Ripple Quarry

NGR: SO 869 368 (approx. centre)

Location, topography and geology

The village of Ripple is situated approximately 2km WNW of Junction 1 of the M50 motorway in Worcestershire. The study area occupies a number of generally flat arable fields to the southwest of the village and adjacent to the River Severn. At the time of survey some of the fields were under stubble while others had been ploughed and/or seeded. The site soils are of the Hollington association (811c) and comprise alluvial deposits locally subjected to flooding (SSEW 1983).

Archaeology

Several cropmarks indicating enclosures have been identified in the northeastern part of the study area and other cropmarks are recorded in fields immediately east of the site. Of the latter, three in particular - a double ditch and a pit alignment - may well extend into the evaluation area. Additionally, there is antiquarian documentary evidence for a possible Romano-British site in the southwestern corner of the study area.

Aims of Survey

A combination of scanning and detailed survey with the gradiometer was carried out in those parts of the study area considered to have high archaeological potential. The aim of the survey was to locate and identify any anomalies of possible archaeological interest within these predefined areas, with particular emphasis on any anomalies that might confirm the aerial photographic (AP) and documentary evidence. The work forms part of a wider research programme undertaken by ***Worcestershire Historic Environment and Archaeology Service*** (***WHEAS***) prior to quarrying of the site.

Summary of Results *

The geophysical survey has had limited success in providing additional information on the archaeological potential of the study area. Perhaps the most promising anomaly highlighted in the data is a small circular feature in the southwestern corner, but the response is indistinct. All the remaining anomalies of possible interest comprise pit type responses, most of which are weak and ill defined, and very faint trends. No clear linear anomalies, suggestive of archaeological ditches have been identified. The low level of magnetic response is perhaps to be expected, given the nature of the site soils. However, the lack of patterns evident in the geophysical data makes an archaeological interpretation inconclusive.

A broad linear band of positive and negative responses in the southwestern corner of the site has the appearance of a natural feature but may reflect part of a canalised stream or former boundary.

*** It is essential that this summary is read in conjunction with the detailed results of the survey.**

List of Figures

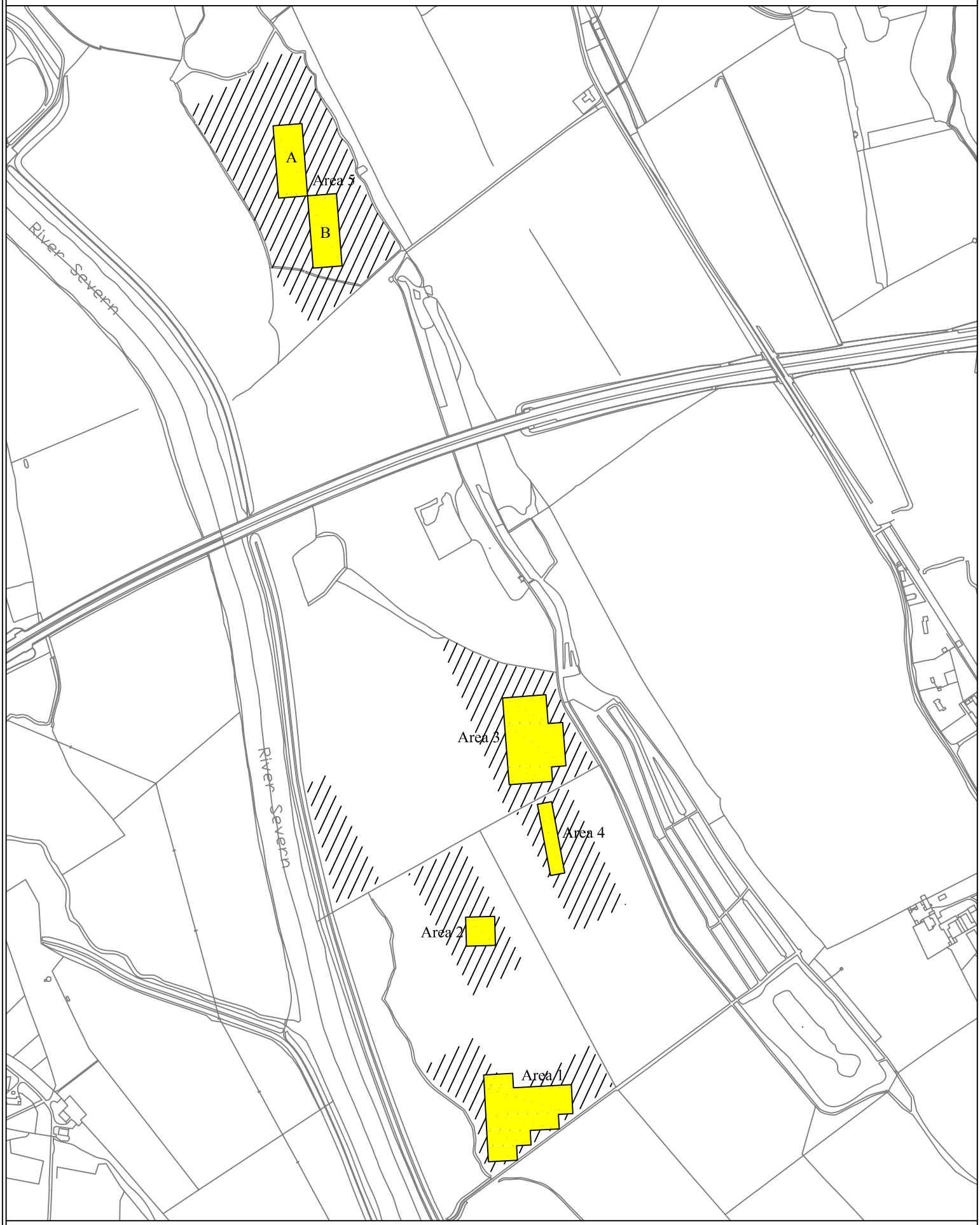

0
metres
200
Area of Scanning (approx.)
Detailed Gradiometer Survey
GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Location Diagram
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service
A
B
Area 5
River Severn
Area 3
Area 4
River Severn
Area 2
Area 1

Figure 1

GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Summary Greyscale - Area 1
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service

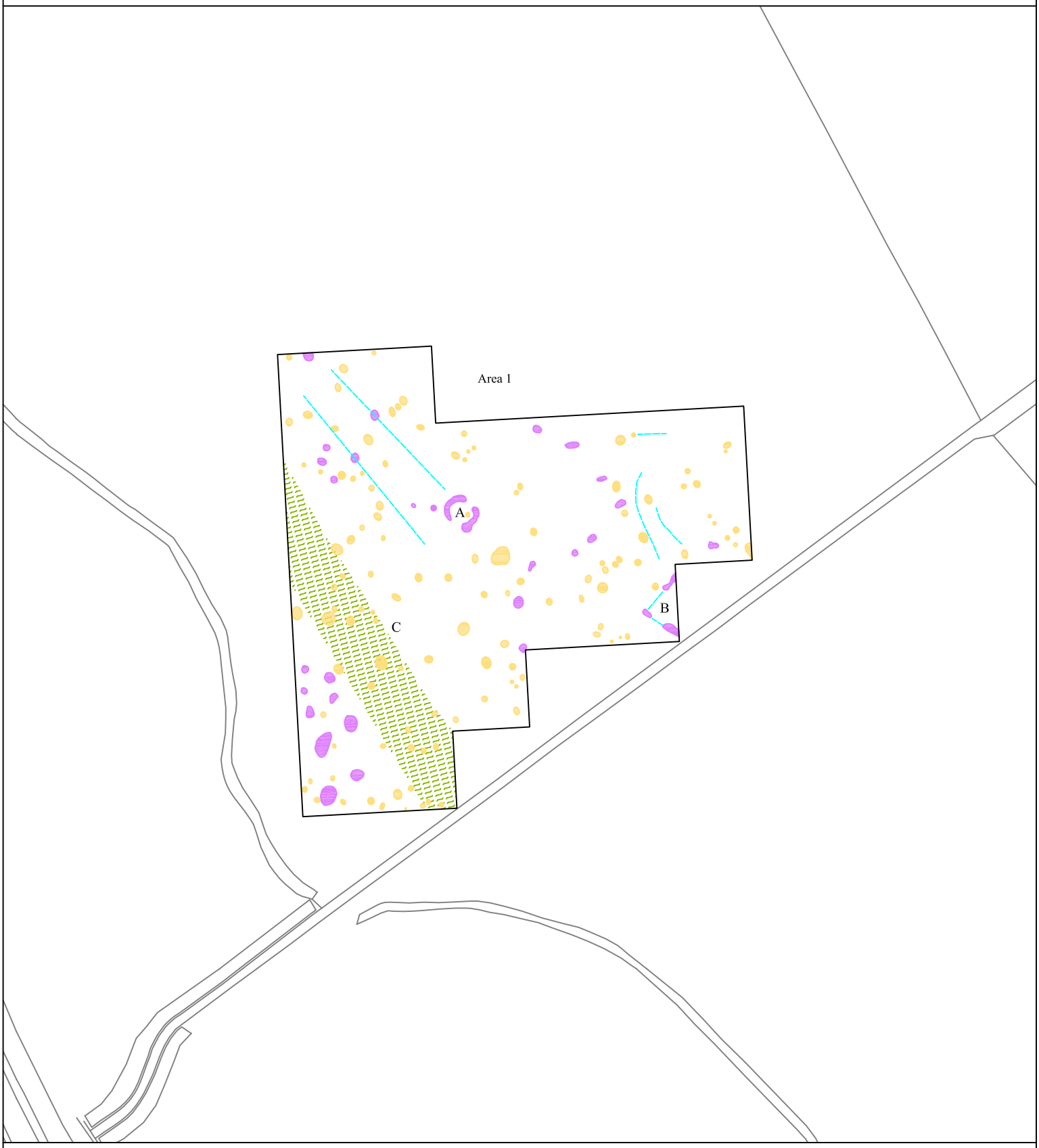
Figure 2

GSB PROSPECTION Ltd.

PROJECT: 2003/88 RIPPLE QUARRY

TITLE: Summary Interpretation - Area 1

Based on a plan provided by Worcestershire Historic Environment and Archaeology Service



?Archaeology/?Natural/?Modern

Trend

?Canalised Stream Channel

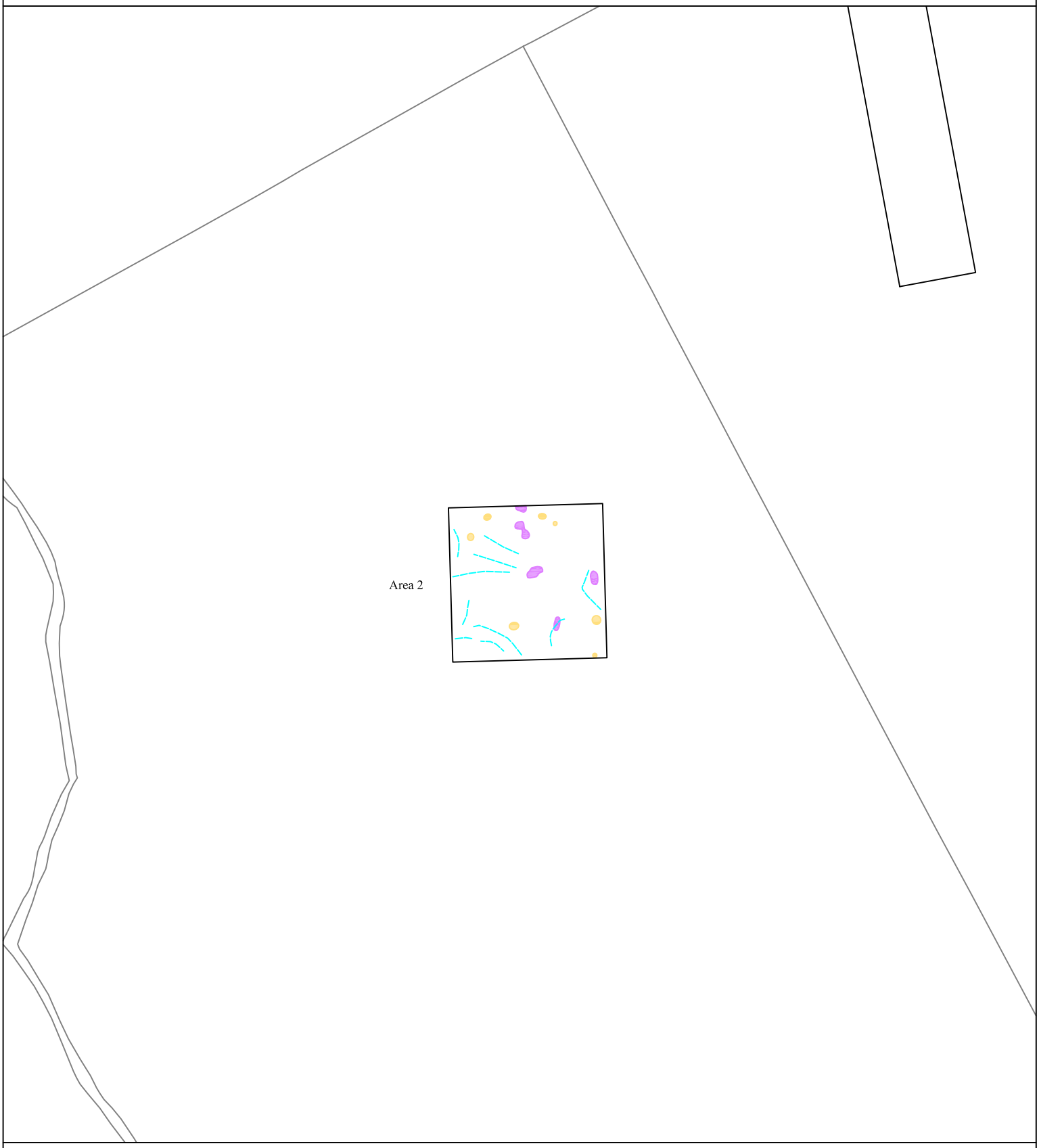
Ferrous

Figure 3

GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Summary Greyscale - Area 2
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service

Figure 4

GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Summary Interpretation - Area 2
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service



?Archaeology/?Natural/ ?Modern

Trend

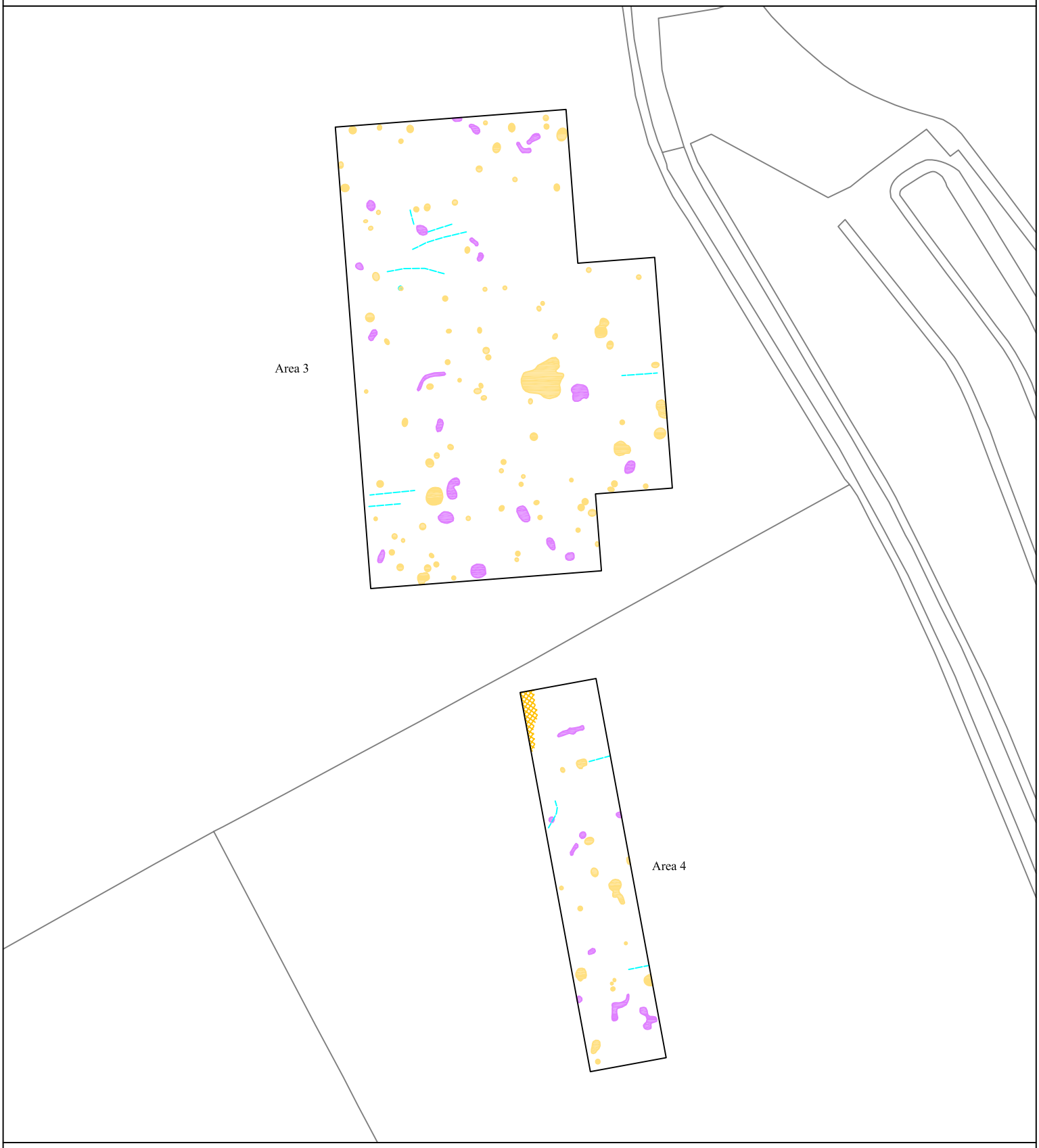
Ferrous

Figure 5

GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Summary Greyscales - Areas 3 & 4
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service

Figure 6

GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Summary Interpretation - Areas 3 & 4
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service



?Archaeology/?Natural/?Modern

Trend

Magnetic Disturbance

Ferrous

Figure 7

GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Summary Greyscales - Area 5
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service

Figure 8

GSB PROSPECTION Ltd.
PROJECT: 2003/88 RIPPLE QUARRY
TITLE: Summary Interpretation - Area 5
Based on a plan provided by Worcestershire Historic Environment and Archaeology Service

?Archaeology/?Natural/?Modern

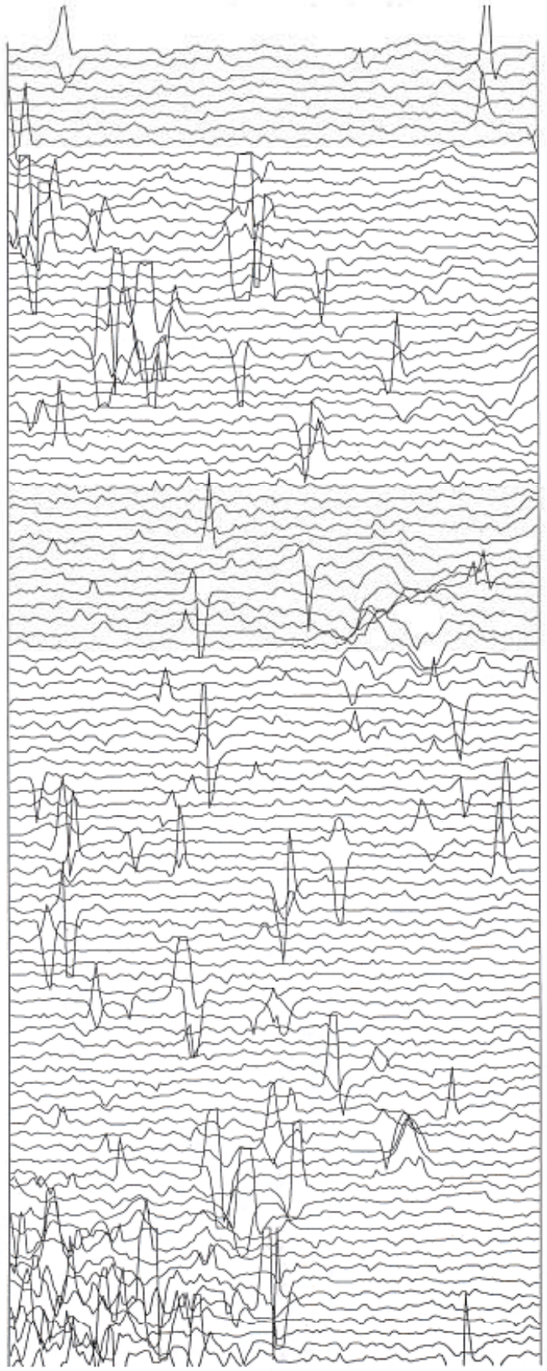
Trend

Increased Magnetic Response

Ferrous

Figure 9

RIPPLE QUARRY
Area 5B



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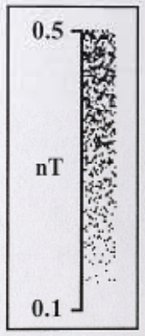

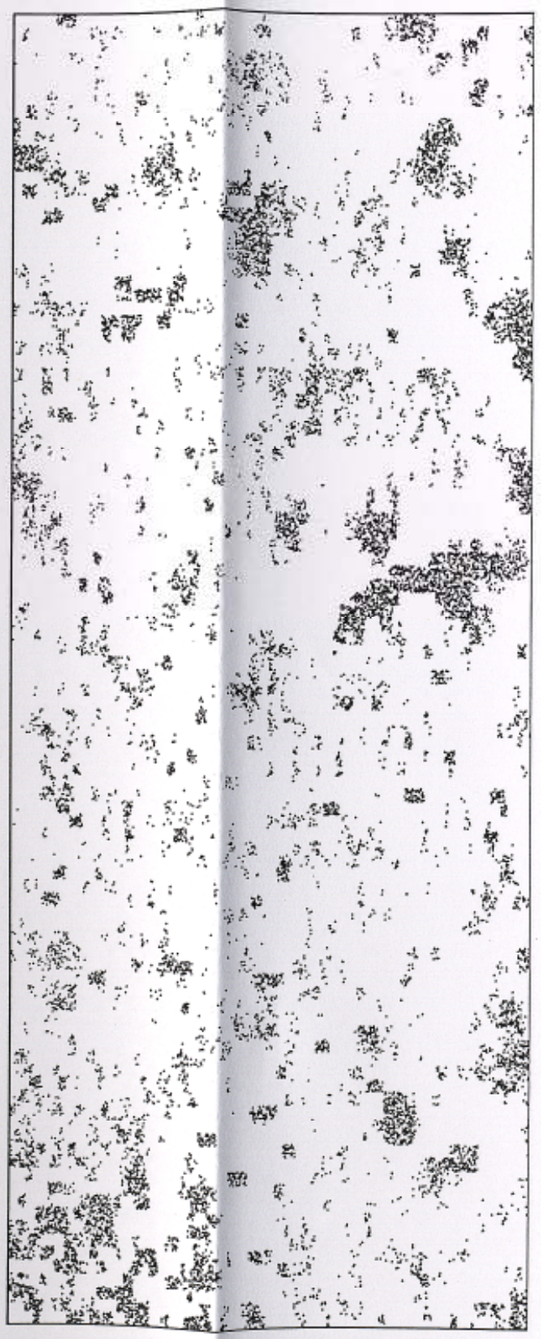

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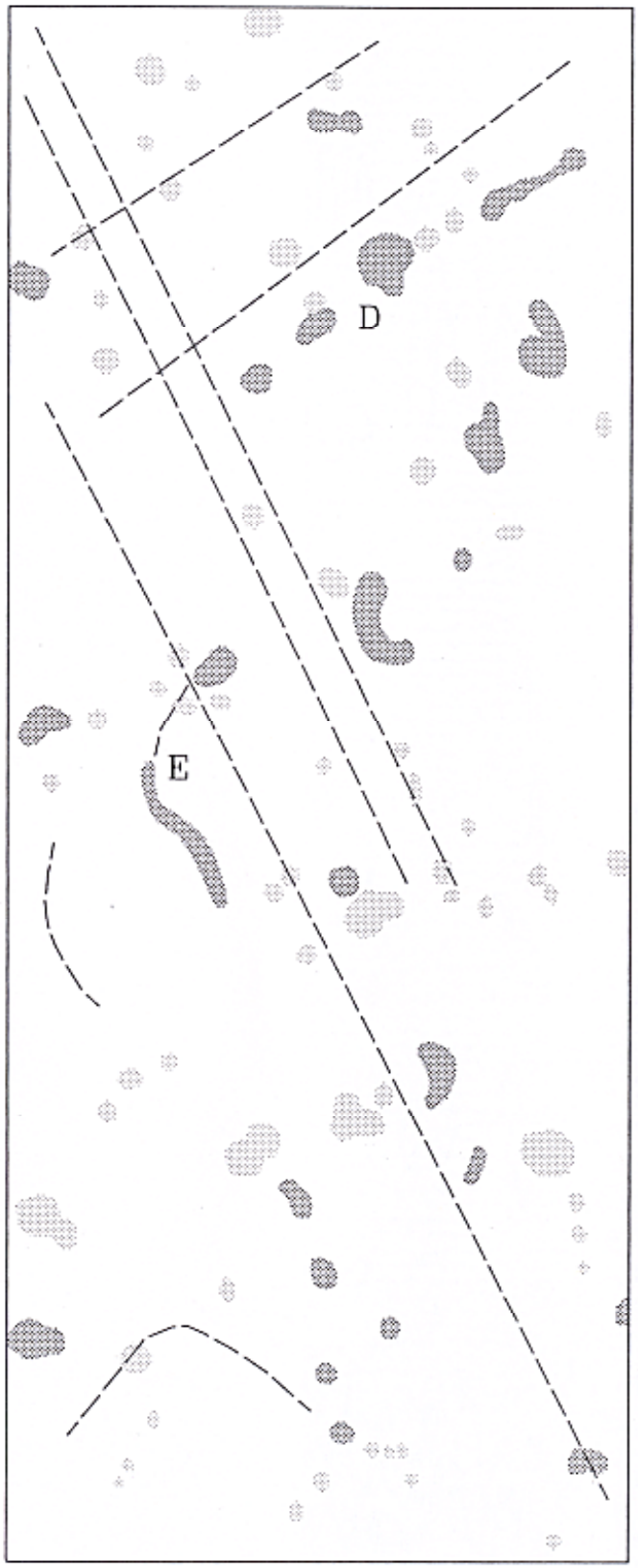
RIPPLE QUARRY
Area 5A



?Archaeology/?Natural/
?Modern

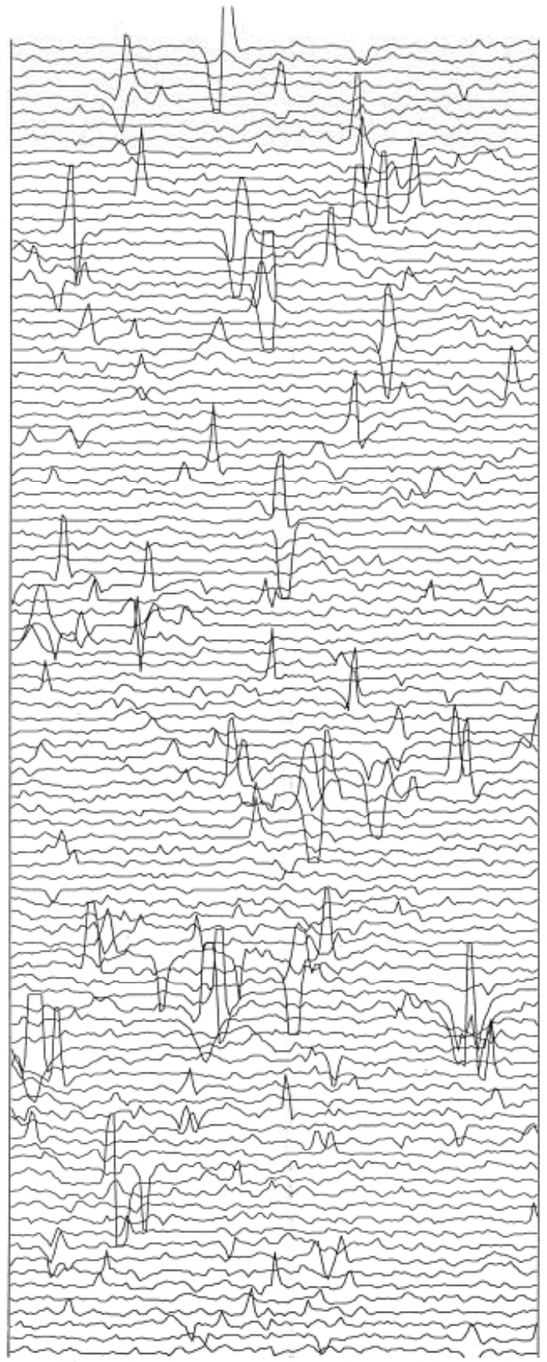
Trend

Ferrous

GSB Prospection Ltd. 2003/88

Figure 19

RIPPLE QUARRY
Area 5A



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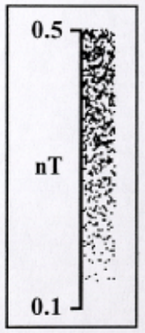

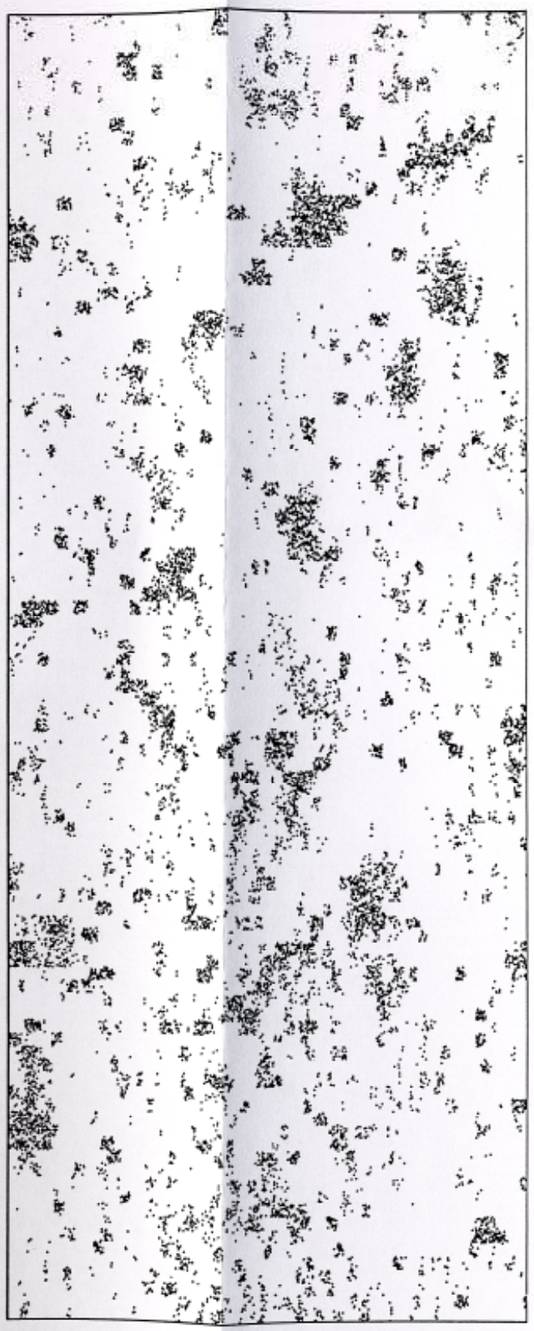

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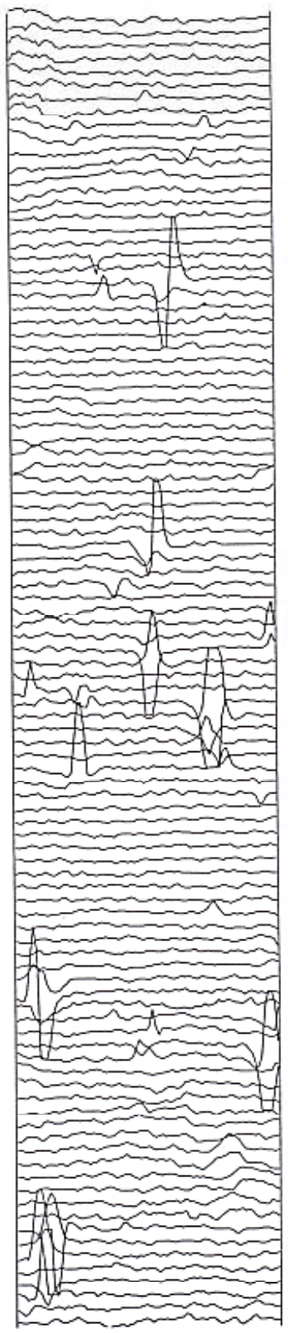
RIPPLE QUARRY
Area 4



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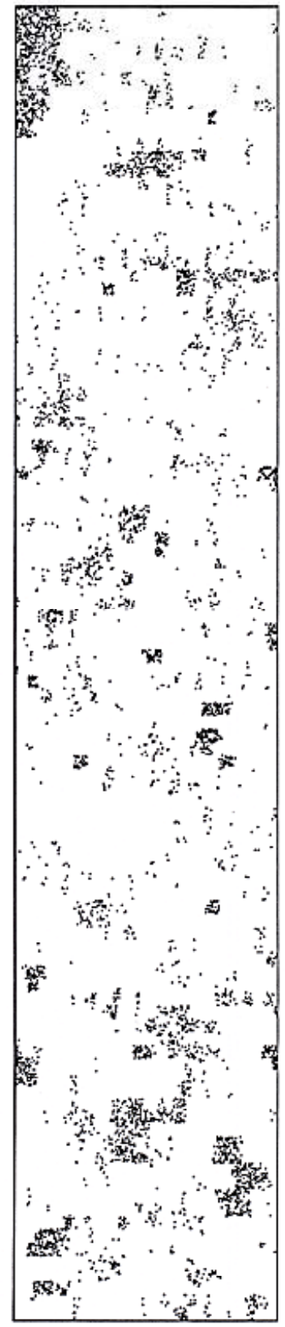
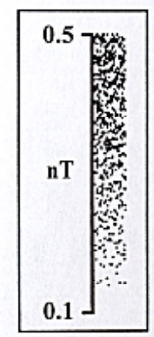
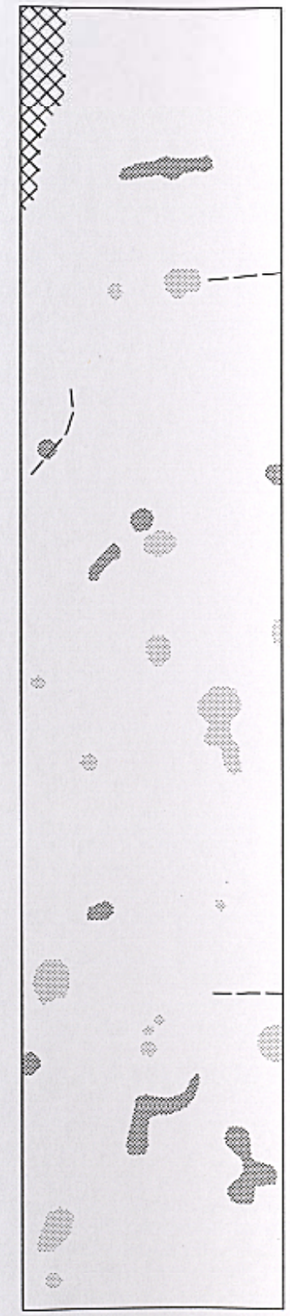
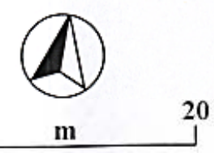
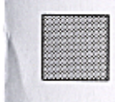


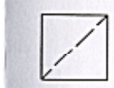




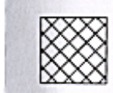




?Archaeology/?Natural/ ?Modern



Trend



Area of Magnetic Disturbance

Ferrous

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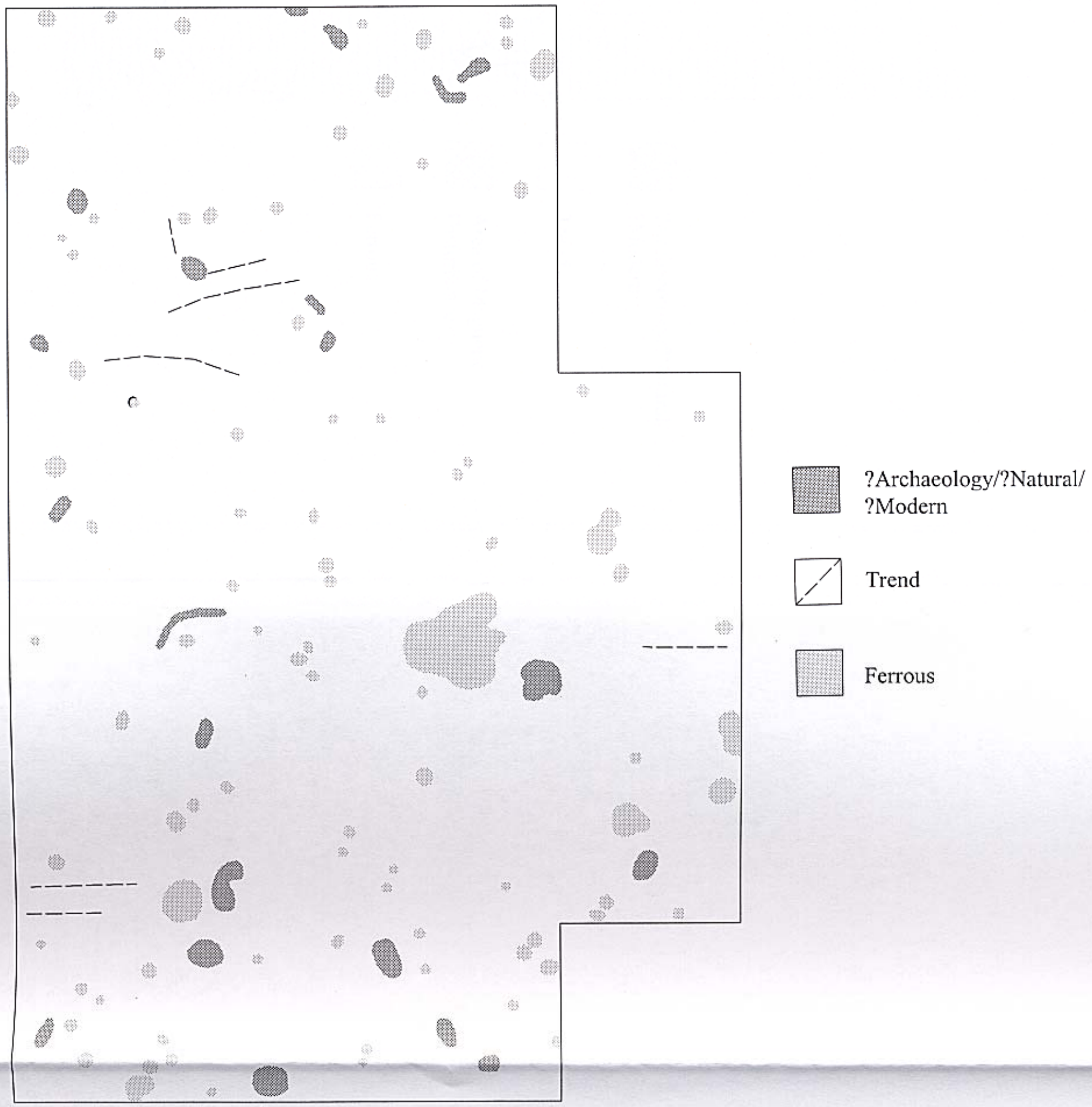
Figure 17

RIPPLE QUARRY
Area 3



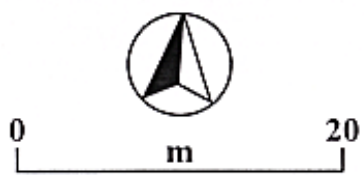


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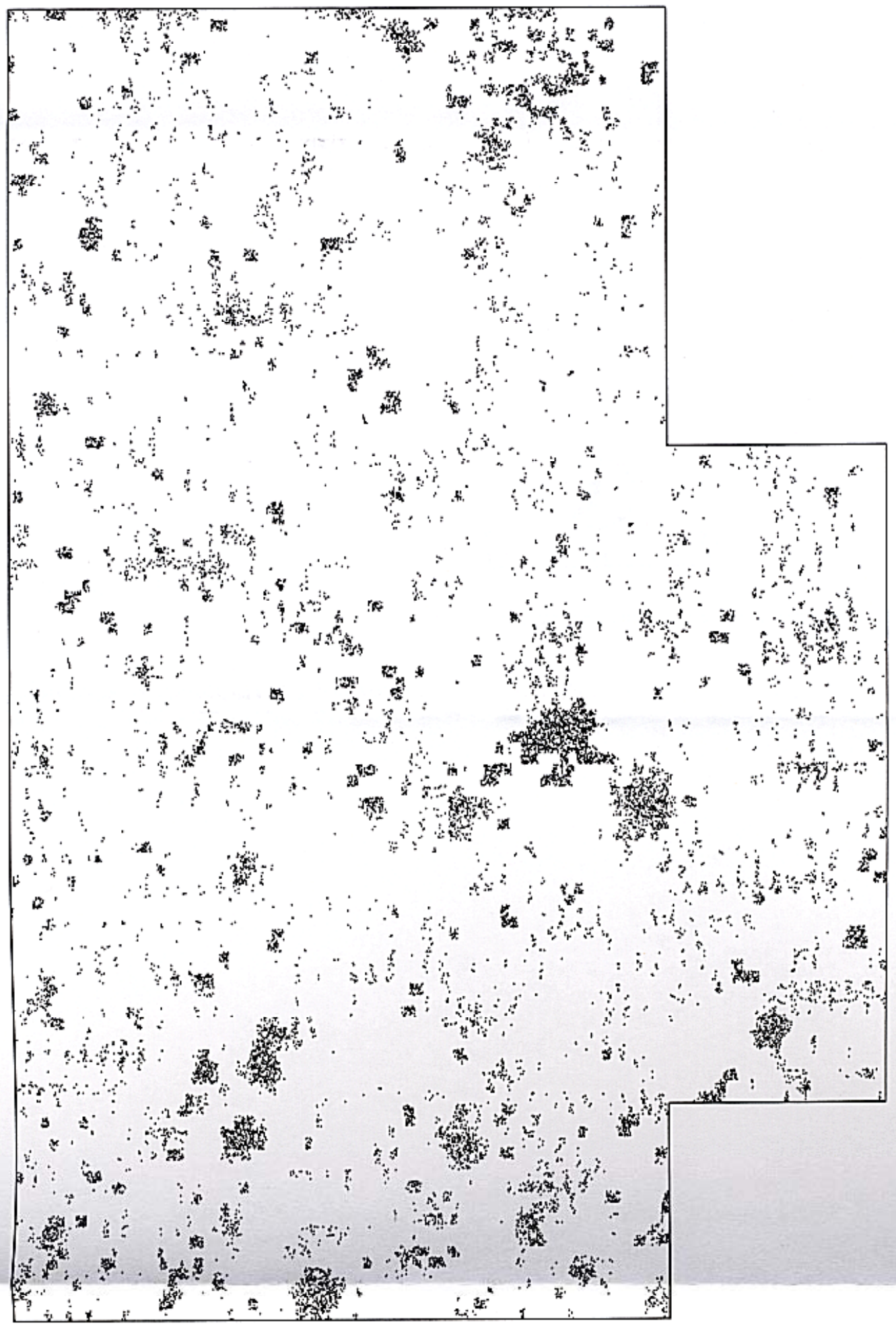
Figure 16

RIPPLE QUARRY
Area 3



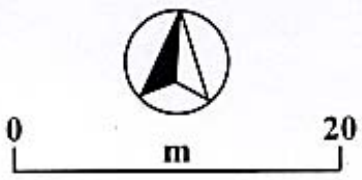


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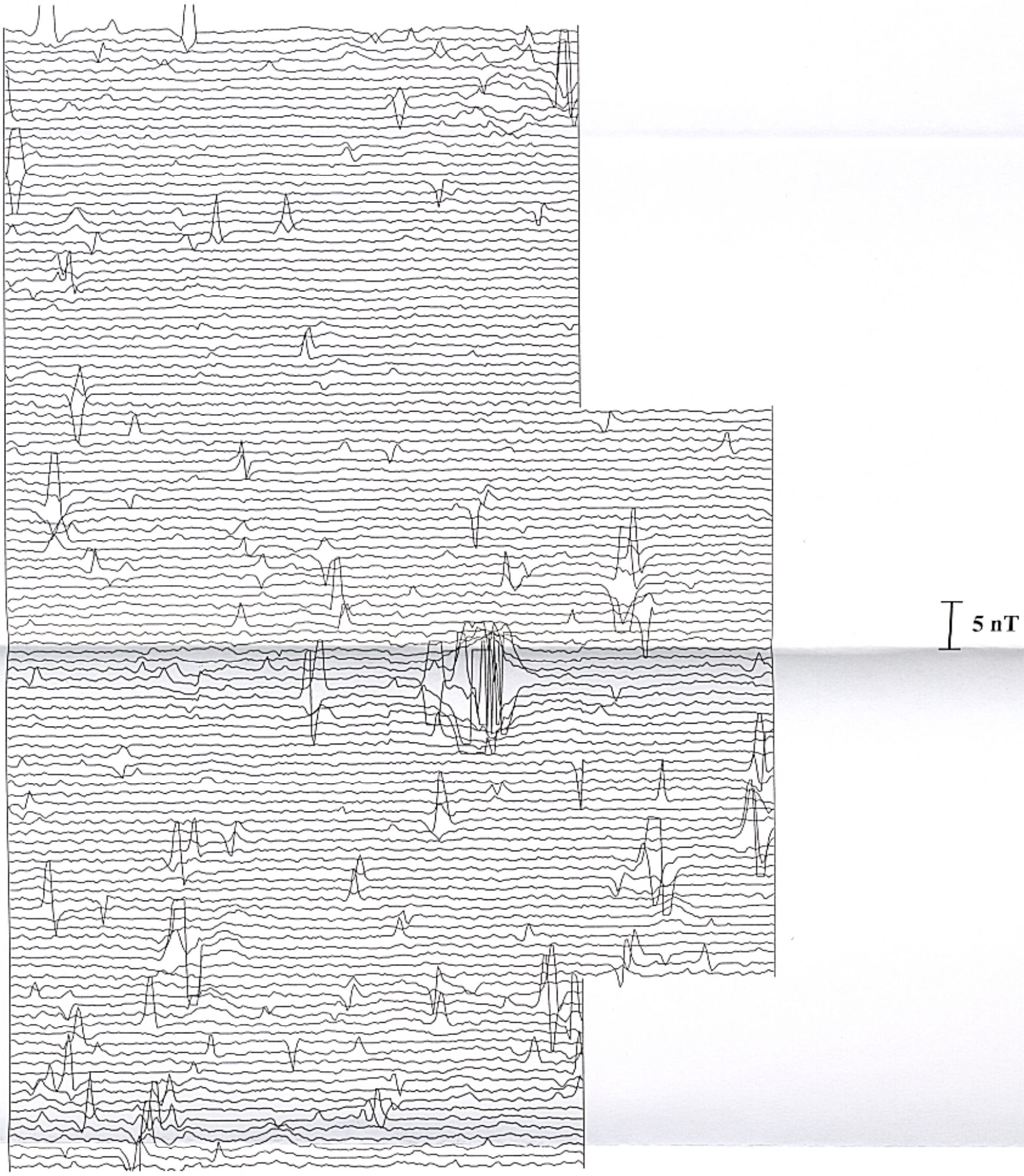
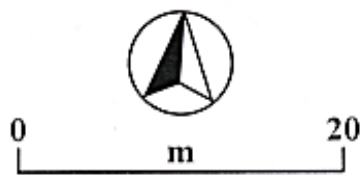
Figure 15

RIPPLE QUARRY
Area 3

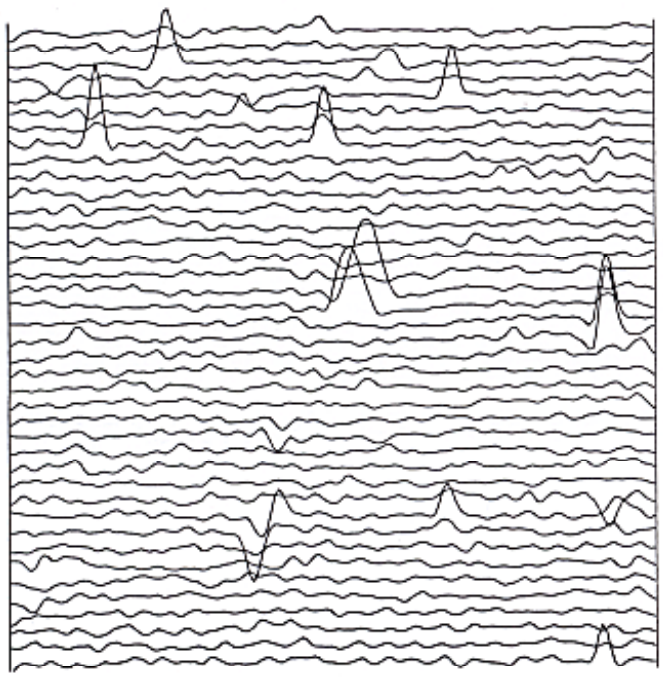




GSB Prospection Ltd. 2003/88

Figure 14

RIPPLE QUARRY
Area 2



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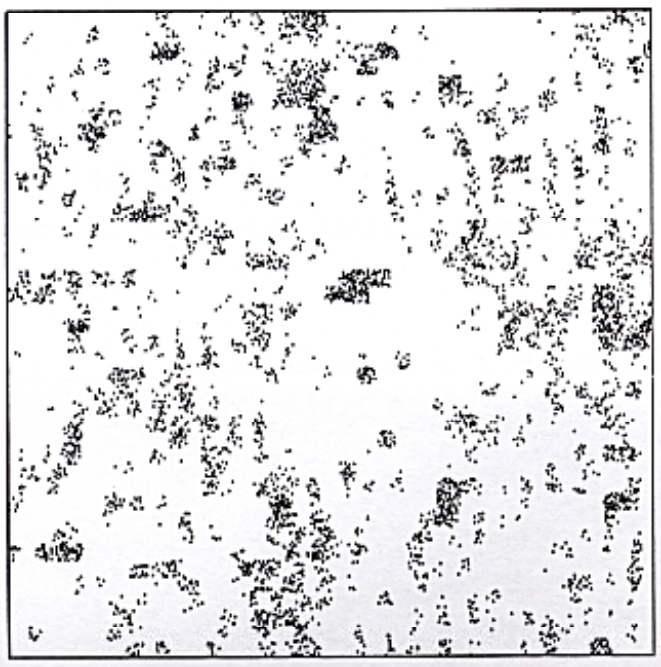

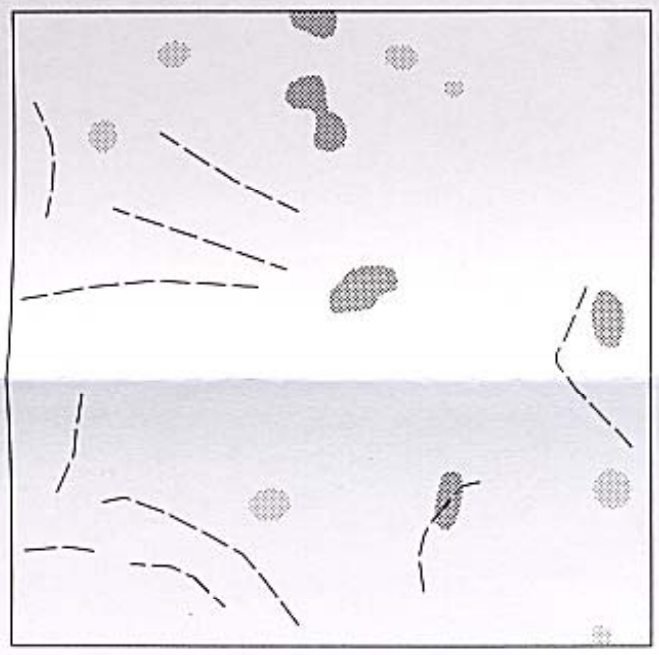

?Archaeology/?Natural/
?Modern

Trend

Ferrous

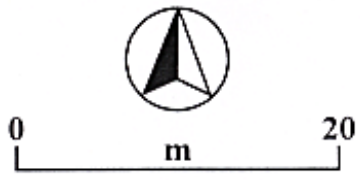

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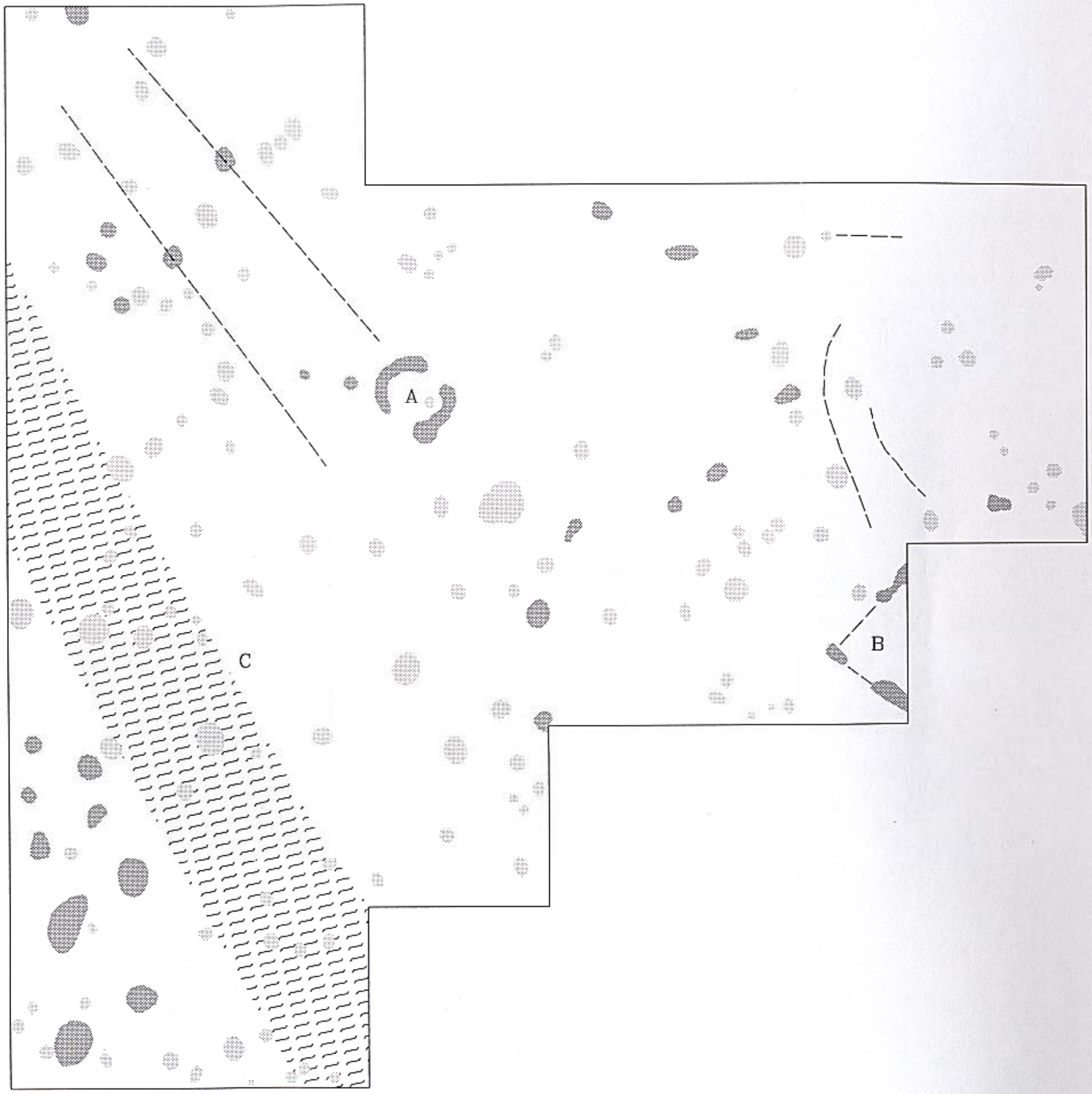
Figure 13

RIPPLE QUARRY
Area 1



?Archaeology/?Natural/ ?Modern

Trend

?Canalised Stream Channel

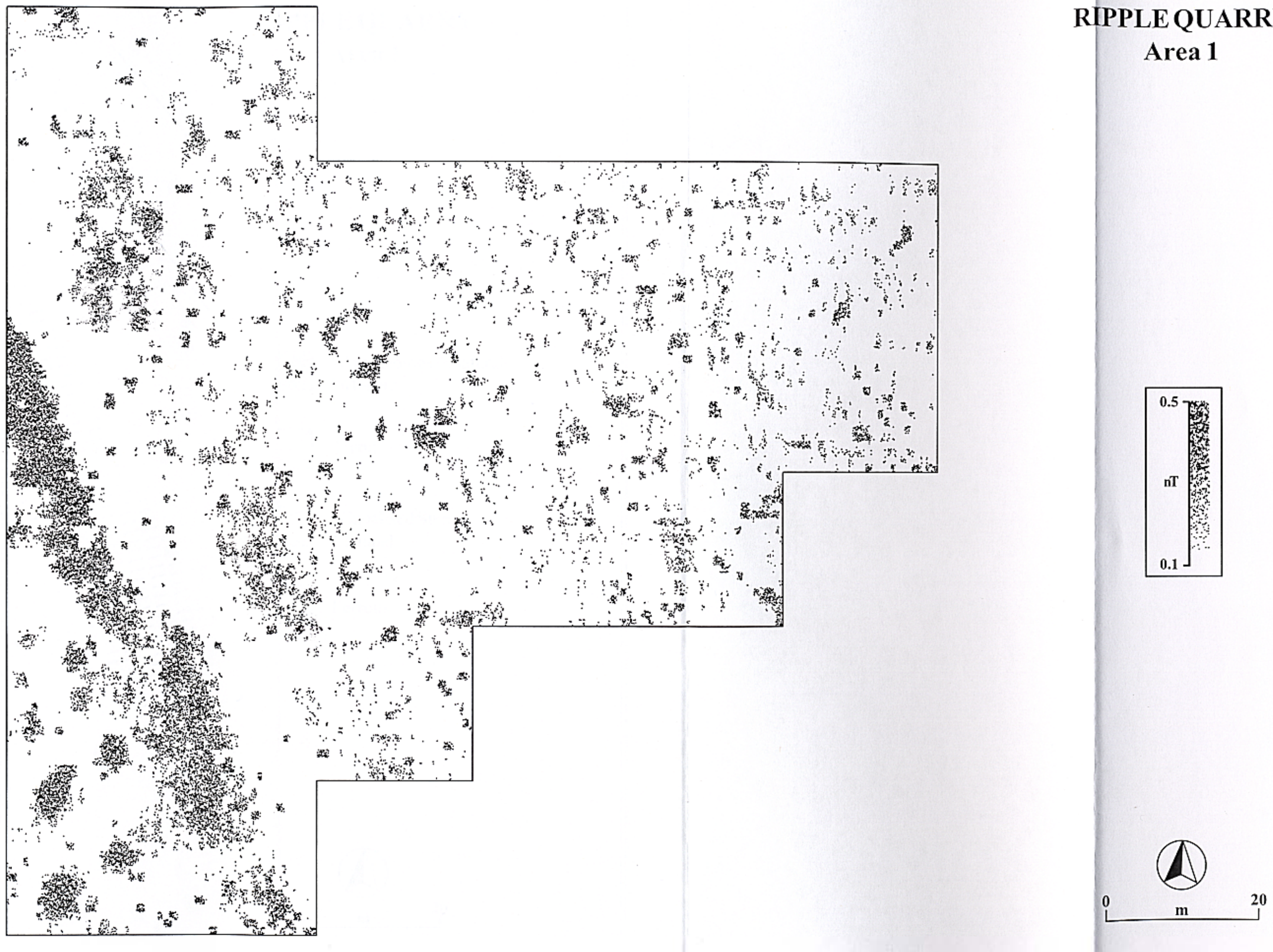
Ferrous

0 m 20

GSB Prospection Ltd. 2003/88

Figure 12

RIPPLE QUARRY
Area 1



GSB Prospection Ltd. 2003/88

Figure 11

RIPPLE QUARRY
Area 1

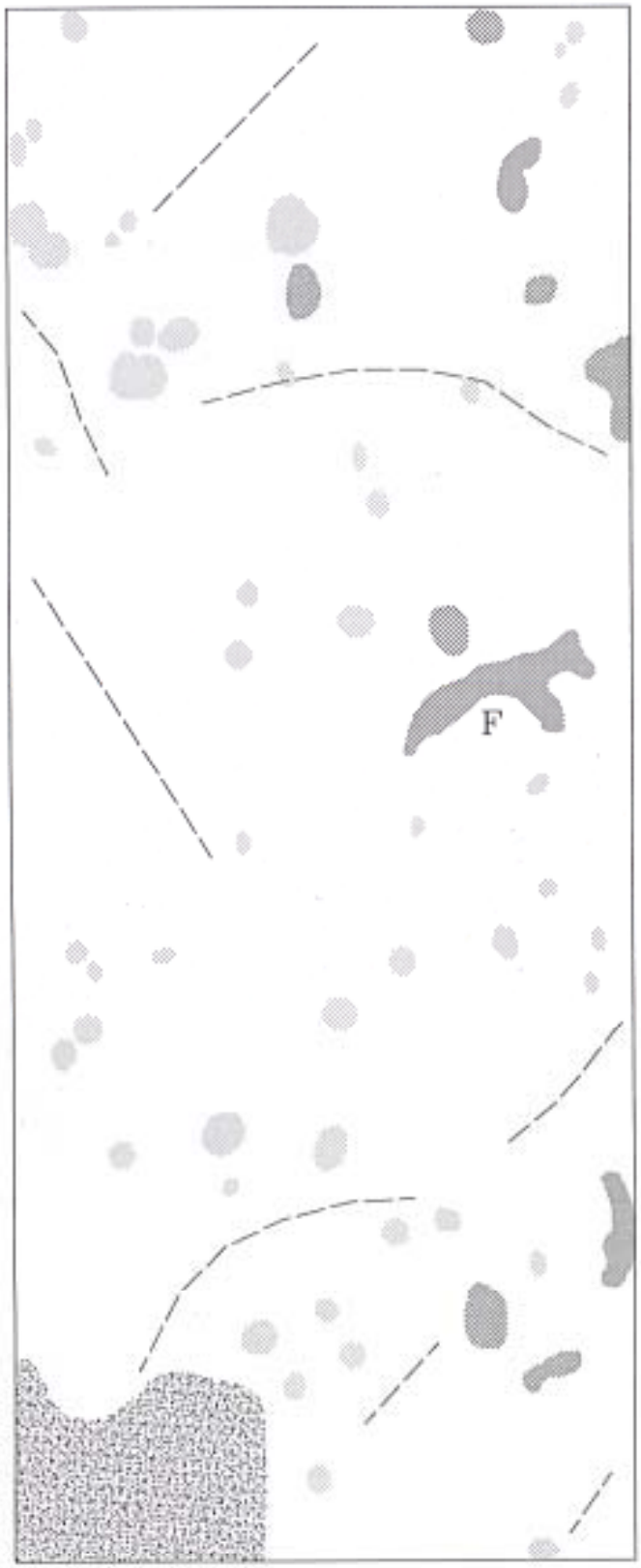
5 nT

0 m 20

GSB Prospection Ltd. 2003/88

Figure 10

RIPPLE QUARRY
Area 5B



?Archaeology/?Natural/
?Modern

Area of Increased
Magnetic Response

Trend

Ferrous